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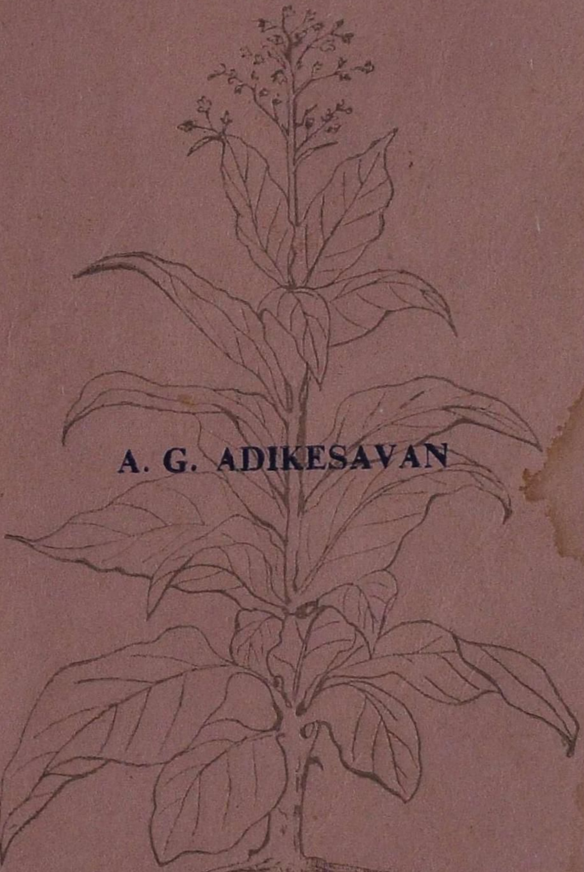
GUIDE TO THE

ECONOMIC PRODUCTS GALLERY



A. G. ADIKESAVAN

GOVERNMENT MUSEUM, MADRAS

GUIDE TO THE
ECONOMIC PRODUCTS GALLERY

By

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Government Museum, Madras

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FOREWORD

In recent years the importance of museums as dynamic centres of education has been increasingly appreciated everywhere and they have come to play a crucial role as powerful institutions of popular education as well as of scholary research in several fields of human knowledge rather than as mere repositories of collections of antiquities and objects of historic and scientific value. The interpretative and educational functions of museums have therefore been intensified in recent years parcticularly in the progressive museums of the West, and in keeping with this trend, the Madras Government Museum had also been endeavouring to modernize its displays and to interpret its collections more effectively by various means including the publication of suitable guide books.

The Economic Products Section of the Botanical Galleries of the Madras Government Museum, contains an excellent collection of representative specimens of economically useful products derived from indigenous species of plants. A cursory glance at the exhibits in the Economic Products Gallery might create an impression that only commonplace things have been collected and exhibited. But a closer and more detailed survey of these products along with the supplementary material such as photographs, descriptive lables, etc., will place these products in a new light and reveal to the visitor interesting and little known facts concerning the dependence of man on plants.

A catalogue of the collections in this gallery was published by Thiru S. N. Chandrasekhara Ayyar, the then Botanical Assistant of the Museum, in 1921. This useful publication has been out of print for several years. But during the past decade the Economic Products Gallery has been complety reorganized and several new exhibits have been added. The gallery has been modernized and the methods of preservation have been considerably improved by introducing attractive built-in show cases with a pleasing internal colour scheme and concealed fluorescent lighting in the place of the old-fashioned, unimpressive sloping show cases of the earlier days. The need for a guide book was therefore keenly felt, and it was considered that instead of reprinting the old catalogue published by Thiru S. N. Chandrasekhara Ayyar, it would be more helpful to bring out a more detailed and informative guide book to the exhibits. Thiru A. G. Adikesavan, the present Curator for Botany, was therefore entrusted with the task of preparing a suitable guide book and the present book is the result of his work. He has highlighted the more important and interesting exhibits in this Section. This work has all the requisite features of a popular guide book and I have great pleasure in commending it as a useful hand-book on the subject that would cater admirably to the needs of students as well as the public visiting the Botanical Galleries of this Museum.

Madras,
24th May 1975.

Dr. S. T. SATYAMURTI,
Director of Museums,
Government Museum, Madras.

PREFACE

Plants are closely linked with man's life and not a day passes when man does not use plant products for some purpose or the other. The Economic Products Section of the Botany Galleries of the Government Museum, Madras attempts to bring out many aspects of this close relationship between man and plants by displaying under classified heads the important plant products that play so vital a role in our daily life.

The Economic Products Gallery is located on the first floor of the main building, and the approach to this Gallery is through the Systematic Botany Gallery, which can be reached through the staircase near the Jaina Gallery or through a small flight of steps from the Coral Gallery.

The exhibits in the Economic Products Gallery are presented in different types of show cases :

1. Built-in wall show cases constructed along the four walls, displaying such items as fibres, cotton, sugarcane, coffee, tea and cocoa, rubber, gums, resins, paddy, millets and pulses, oil-seeds and oils, spices and condiments, narcotics, drugs, dyes, tans, cork, valuable and edible sea-weeds and paper manufacture.
2. The centre case, adjacent to the show case exhibiting cotton, contains the model of the handloom.
3. At the centre of the hall there are two oblong, vertical cases containing the green manure plants.
4. In the sloping cases arranged between the pillars, there are exhibited mats, timbers, toys, rayon and miscellaneous articles.

Since the displayed items are considerably large in number, attention has been focussed in this Guide book, only on relatively more important and selected specimens. Lables are provided for individual exhibits in the Gallery.

Though many of the products appear to be commonplace objects, little is generally known about their origin, uses and potentialities. It is the aim of this short guide to help the visitors have a better appreciation of all these everyday objects that mean so much to us in our daily life. The information provided is brief and non-technical as far as possible to make this Guide widely useful and popular. Scientific names have, however, been given so as to make it useful to students of Botany also. If this Guide would enthuse the visitors to look closer at the objects on display and to learn more about them, it would have fulfilled its purpose admirably.

I am indebted to Dr. S. T. Satyamurti, Director of Museums, Government Museum, Madras for his encouragement in bringing out this Guide. I am thankful to Thiru M. S. Chandrasekhar, Asst. Director, for his valuable guidance. I am thankful to Thiru N. Harinarayana, Curator, Chemical Conservation Section for going through the manuscript and making useful suggestions. Tvl. D. I. Victor and M. Muthukrishnan prepared the sketches for the guide and I thank them for the help. Tvl. K. Natarajan, G. Shanmugam and S. Velu Pillai of the Printing Section took keen interest in bringing out this publication speedily and elegantly, and I record my thanks to them for this.

A, G. ADIKESAVAN

FIBRES

The cultivation of fibre-yielding plants and the manufacture of these products into textiles, ropes, cordage, brushes and matting are among the most important industries of the world. The industries, moreover, are of great antiquity, for we have definite evidence for the cultivation and use of flax as a textile during the stone age from the Lake Dwellings of Switzerland and for the occurence of linen cloth in the tombs of Egypt. How and when man became aware of the possibilities of vegetable fibres as materials for clothing it is not easy to say, but it is not improbable that he first employed the fibres to supply his need for string and cordage, especially in his hunting expeditions, and that gradually the idea of weaving the thread to form a fabric occured to him.

The fibres employed at the present day by both civilised and uncivilised people are as numerous as the uses to which they are put, and there are several methods of classifying them for purposes of description.

The vegetable fibres may be classified botanically into bast or inner-bark fibres (e.g., jute, hemp) leaf fibres (e.g., sanseviera, agave) and hair-like or floss fibres surrounding the seeds of certain fruits (e.g., cotton) and coir fibre consisting of the husk of the coconut.

JUTE AND ITS SUBSTITUTES

Corchorus olitorius, Linn.

TILIACEAE

Eng. Jute - Tam. Sanal

There are two botanical varieties of jute plants: *Corchorus capsularis, Linn.* and *Corchorus olitorius, Linn.* Both these varieties are similar in general appearance, but differ in the form of the seed pods. The generic name of the plant is derived from the Greek "Khorkhores". The ancient literature of Greece, Egypt and Arabia contains a description of a plant used as a pot herb in those countries. The plant *C. capsularis* is supposed by Dr. J. F. Royle to be the same as *C. olitorius*. It is not accepted by most of the people because the weather conditions and water facilities are not suitable for the *C. olitorius* in the Mediterranean regions. However Sengupta says, "The plant *Corchorus olitorius* finds a congenial home in fertile deltas having a wet tropical climate in the Bengal. Perhaps Olitorius is a native flora of Bengal growing wild before its use as a domestic or commercial fibre."

The jute plant is an annual plant and grows in a straight cylindrical stalk, branching near the top to a height of five to twelve feet. Between the pith and the outer layer of the stalk lies the fibre for which the plant is grown. It is extensively grown both in West Bengal in India and in Bangaladesh.

Jute grows best in a hot damp atmosphere and flourishes especially in a highland district. The seed is sown in the spring either broadcast or in nurseries. Harvesting takes place about three months later when the plants are in bloom. The plant stalks are gathered into bundles and placed in stagnant water to undergo a retting process which is effected in varying periods from two or three days to a month. Then the barks are stripped off from the stem in long strands. After this the fibre is washed until it is freed from vegetable debris and after further washing, the jute is wrung out and dried on lines.

Jute is mostly used for the manufacture of 'gunny' bags and cotton baling. But it is also a most important cordage and twine material; the waste material resulting from these manufactures is used in paper production. It is also used in making carpets and in the manufacture of linoleum.

Adansonia digitata, Linn.

BOMBACACEAE

Eng. Boabab ; - Tam. Aanai puli

A tree of Upper Guinea cultivated in many parts of South India. The bark yields a strong fibre, used in India for elephant saddles; in Africa for rope, twine and cloth. It is also useful for the manufacture of a strong paper suitable for currency notes.

Agave americana, Linn.

AMARYLLIDACEAE

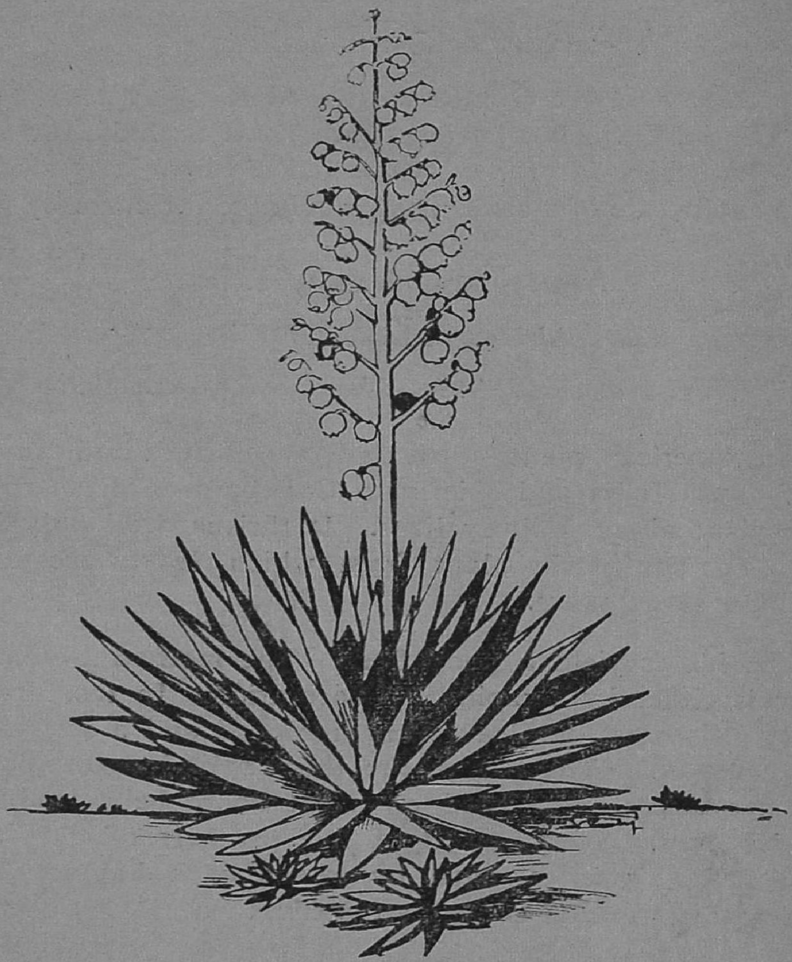
Eng. American Aloe - Tam. Aanaikathazhai

An American plant cultivated and naturalised in various parts of South India and chiefly in Coimbatore, often found as a hedge plant along railway lines. It thrives well only in open places. The age of the plant from which leaves are taken is from six to seven years.

The leaves yield a good fibre. The method of extracting the fibre is either by scraping or maceration. In the former case the sharp spines of the leaves are removed and a small part of the top cut off. The leaves are then split longitudinally into four or five pieces and placed on a flat board held firmly by the toes and beaten. As a result of this the pulp of the leaves is liberated and this is removed by means of a bamboo scraper. What is now left behind is merely the fibre.

In maceration, after the spines are removed, the leaves are beaten and thrown in bundles into tanks or wells in which they

are left to macerate for a fortnight or twenty days. The bundles are taken out, dried and bleached in the sun. The fibre is used for cordage, agricultural purposes, carpets, mats, and brushes and the fibre-waste for paper making.



AMERICAN ALOE

CORDAGE

Cordage means all materials from strings to ropes. Almost all fibres may be used for cordage. But certain fibres are more suitable for this purpose than the others. It is such fibres that are displayed in the show case.

Abroma agusta, Linn.

STERCULIACEAE

Eng. Devil's Cotton., Tam. Chivappttutti

A shrub, found both wild and cultivated throughout the hot moist tracts of South India. The bark of the twigs yields a strong, silky, white fibre which is separated by steeping the bark in water for about a week. The fibre is used for cordage and as a substitute for hemp and flax.

Albizzia amara, Boiv.

LEGUMINOSAE

Tam. Tuirnchil

A deciduous tree, common in the dry forests of South India. The bark yields a coarse fibre used for cordage.

Boehmeria platyphylla, Don.

URTICACEAE

A shrub, common in Northern India, and the Western Ghats. The inner bark yields a strong white fibre used for cordage.

Bombax malabaricum, DC.

MALVACEAE

Eng. Silk Cotton Tree. Tam. Ilavam

A silk-cotton known as Madar floss is obtained from the seeds. This fibre is soft, white and has a fine silky gloss. The fibre is used for pellet bows, fishing-rods, nets for catching birds, and cloth used by Gadabas, an aboriginal tribe of the hills of Vishakapatnam district. The floss is used for stuffing quilts etc. and is sometimes spun and made into fishing lines and nets.

Buchanania latifolia, Roxb.

ANACARDIACEAE

Eng. Cuddapah Almond. Tam. Sarapparupu Maram.

A middle-sized tree, met with in the dry forests throughout India, and ascending in the sub-Himalayan tract to 3000 ft. The fibre is used for cordage.

Butea superba, Roxb.

LEGUMINOSAE

A large climber, common in Northern India and Coramandal Coast, usually on black cotton soil. The roots and young branches yield a strong, useful fibre used for cordage.

Calotropis gigantea, Br.

ASCLEPIADACEAE

Eng. Gigantic Swallow Wort. Tam. Erukkan

A great, spreading shrub common on the plains of South India. The inner bark yields the madder fibre which is said to

be one of the best of Indian fibres. The tender branches are cut and exposed to weather. The skin is then peeled off and the fibrous substance between the wood and the bark is easily separated by hand.

Cannabis sativa, Linn.

URTICACEAE

Eng. Hemp. Tam. *Ganja*

An annual plant, cultivated more or less throughout India principally for its yield of the narcotic, ganja. The stem yields the hemp fibre, but the narcotic-yielding plants produce only a very inferior fibre, used for cordage, ropes and coarse textiles.

Ficus religiosa, Linn.

URTICACEAE

Eng. The Peepul Tree. Tam. Arasu

A tree sacred to the Hindus and Buddhists, found all over South India, often planted in the vicinity of temples. The bark contains a fibre which is coarse and used for cordage.

Grewia tiliaefolia, Vahl.

TILIACEAE

Tam. Una

A tree common all over South India. The bark yields a strong, hard, yellow-brown fibre used for cordage.

Pandanus odoratissimus, Roxb.

PANDANACEAE

Eng. Indian Screw Pine. Tam. Thazai

A much-branched shrub, common on the coast of South

India, much planted for its scented flowers. The leaves yield a tough, white, glossy fibre which is extracted by cutting them into slits and exposing them in water. The drops or aerial roots also yield a fibre. The leaf fibre is used for cordage, hunting-nets, ropes for fishing-nets, matting, thatch, etc. The fibre of the roots is used for painting brushes and mixing with flax for the manufacture of gunnies and ropes. The aerial roots are used for whitewashing.

Pongamia glabra, Vent.

LEGUMINOSAE

Eng. Indian Beech. Tam. Pungu

A tree found throughout India, especially along the banks of streams and in tidal and beach forests of South and Central India. The bark yields a coarse brown fibre, used for cordage.

Sida carpinifolia, Linn.

MALVACEAE

Eng. Hornbeam-leaved Sida.. Tam. Vattatrippi

A perennial undershrub, found all over the hotter parts of South India. The plant yields a good fibre said to be suitable for higher textile purposes and cordage.

MISCELLANEOUS FIBRES

In this show case are grouped the various fibres which are important in their own way.

Acacia intsia, Willd.

LEGUMINOSAE

A large climbing shrub, common all over South India, 4000 ft.

above sea-level. The fibre is used as a substitute for soap in washing the hair.

Ananas sativus, Schult. f.

BROMILIACEAE

Eng. Pineapple. Tam. Annasipazam

Although the pineapple plant is usually grown for its fruit, in some parts of the East, notably in the Philippines and Malaya the fibre yielded by the leaves is the object of the cultivation of the plant.

The plant is low-growing; and the leaves are about two to three feet long and one or two inches wide. To obtain the fibre the leaves are scraped with a bamboo instrument. Modern machinery, however is also nowadays employed. The fibre obtained is washed in water and then dried in the sun. It is white, soft, flexible and very durable, even when exposed to the action of damp. The celebrated Pina cloth of the Philippines is prepared from this fibre, and the Chinese employ it in the manufacture of coarse, strong fabric.

Anona reticulata, Linn.

ANONACEAE

Eng. True Custard Apple - Tam. Ramasitappalam

An American tree, cultivated in various parts of South India. The bark of the young twigs yields a good fibre used for cordage.

Boehmeria nivea, Gaudich.

URTICACEAE

China grass

A shrub of China and Japan introduced in India. The stem contains one of the finest and strongest fibres. It is extracted by a special process of retting and decortication. In India the fibre is spun into coarse thread for fishing lines; in

Europe, for sacking, sail cloth, belting, table-cloth, sheeting, shirting laces, fishing lines, nets, cordage and paper.

Ficus bengalensis, Linn.

URTICACEAE

Eng. Banyan. Tam. Aalamaram

A tree common all over South India, much planted as an avenue tree. The bark and the ariel root yield a coarse fibre. It is also used in the manufacture of paper.

Girardina heterophylla, Dcne.

URTICACEAE

Eng. Nilgiri Nettle

An annual plant common on the Nilgiris and the Western Ghats. The inner bark abounds in a long, white, soft and silky fibre which is extracted by the hill-men of the Nilgiris by a process of boiling. The fibre is used for spinning into thin coarse thread by the Todas of the Nilgiris.

Hibiscus abelmoschus, Linn.

MALVACEAE

The Musk Mallow

A herbaceous bush, springing up with the rains and flowering in the cold season. It is common all over hot parts of South India. Its stem yields a strong fibre which is highly valued. Used for cordage and forms a very good substitute for jute. Wetting does not affect the strength of the fibre.

Musa paradisiaca, Linn.

MUSACEAE

Eng. Plantain. Tam. Vazai

A perennial herb, extensively cultivated throughout South India. The plantain has proved to be valuable on account of its fruit, both in its unripe and ripe state. The plant

is also to be esteemed on account of the fibre with which every part of it abounds. The cultivation of the plantain is on the whole very simple, as it will succeed in almost any soil where the climate is warm and moist. The plaintain will flourish in the poorest soil and near brackish water and its cultivation might be extended with little difficulty The fibre is used for making ropes, cordage, fishing tackle, paper mats, etc.

Sida cordifolia, Linn.

MALVACEAE

A small annual or perennial weed, found in moist places all over South India. The plant yields a good fibre said to be suitable for higher textile purposes.

Sterculia populifolia, Roxb.

STERCULIACEAE

A small tree, common in most parts of India. The bark yields a good fibre. It is used for making ropes.

BRUSHES

Brushes are among the important articles of daily use and for this purpose also plants provide the material.

Borassus, flabellifer, Linn.

PALMACE

Eng. Palmyra Palm. Tam. Panaimaram

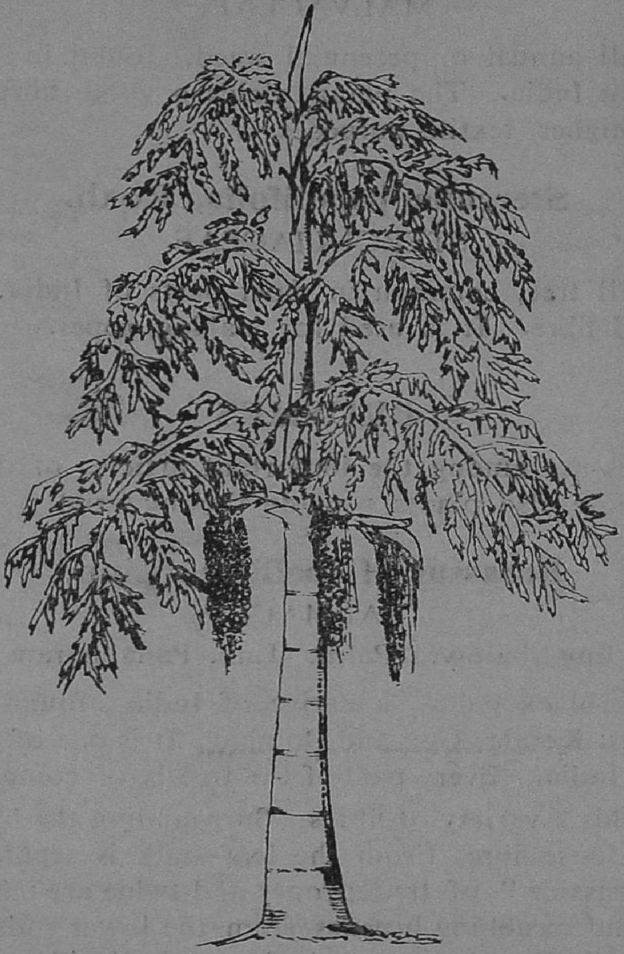
A tall, black palm, a native of India, found in Bengal, Bihar, Madras, Kerala, Goa and Bombay. It is one of the most useful plants of India. Every part of the tree is of commercial value. The palm yields a variety of fibres. Surrounding the leaf base is a strong, wiry, loose fibre. From the leaf-stalk is separated a fibre, called the "bassine" of trade; ropes and twine are made from the finer fibre, and scrubbing brushes from the lower ends of the leaf-stalks. "Tar" fibre is extracted from the inside of the stem: it is used for making fish-traps.

Caryota urens, Linn.

PALMACE

Eng. Sago palm. **Tam. Koondal Panai**

A handsome palm, common in Nepal upto 5000 ft. elevation, Assam, Orissa, Mysore, Coorg and Travancore and is much planted in gardens. The leaves of the leaf - stalk yield the **Kittul** fibre which is very strong and durable and will resist for a long time the action of water. Kittul fibre is much used for fishing-nets, ropes, baskets, brushes, brooms etc.



SAGO PALM

COIR

"The name of this fibre is said to come from Malayalam *Kayar* through the Portuguese corruption *Colro.* "The word appears in early Arabic writers in the forms *Kanbar,* arising probably from some misreading of the diacritical points (from Kaiyar)" (Yule & Burnell). Kayer is also a Tamil word for rope" (Watt). Coir is always derived from the coconut.

Cocos nucifera, Linn.

PALMAE

Eng. Coconut. Tam. Thennai

A tall, stately palm, straight or curved, marked with ring-like leaf scars. Its original home is not known, but it is common throughout the sea coast regions of India and other Eastern countries. The palm is of utmost value to man; every part of it is of considerable utility.

The fibre from the husk is known as coir and is of considerable commercial importance. It is made into ropes; they are durable even under sea water. and so they are in great demand for use as cables for shipping purposes. The coir fibre is extensively utilized as a stuffing material for upholstery and saddles, and for the manufacture of matting, door-mats, carpets, and brushes. Recently the fibre is used for making hard boards and shock-proof packing material.

COTTON

Gossypium arboreum, Linn.

MALVACEAE

Eng. Cotton. Tam. Paruthi

No agricultural commodity in the world has exercised such a profound influence on men and matters as cotton has done from time immemorial. With a history going back to unrecorded antiquity, the fibre has maintained its pristine importance to

this day. In India it had the pride of place among the cash crops from the earliest times. It is mentioned in the Rig-Veda. Manu the Law giver also refered to it in his Dharmasastra. It was the excellence of Indian cotton fabrics termed as "veils of woven wind" which among other things impelled European countries to seek new trade routes with India. India was the centre of cotton cultivation and manufacture in the early days and for long afterwards. Indian cotton goods were sent to many parts of the world, and the word "calico" was originally given to this familar material because it came from the Calicut Port. Later explorers found cotton in other regions. For example, in 1492 Columbus noted that it grew abundantly in West Indies and on the neighbouring coasts of America.

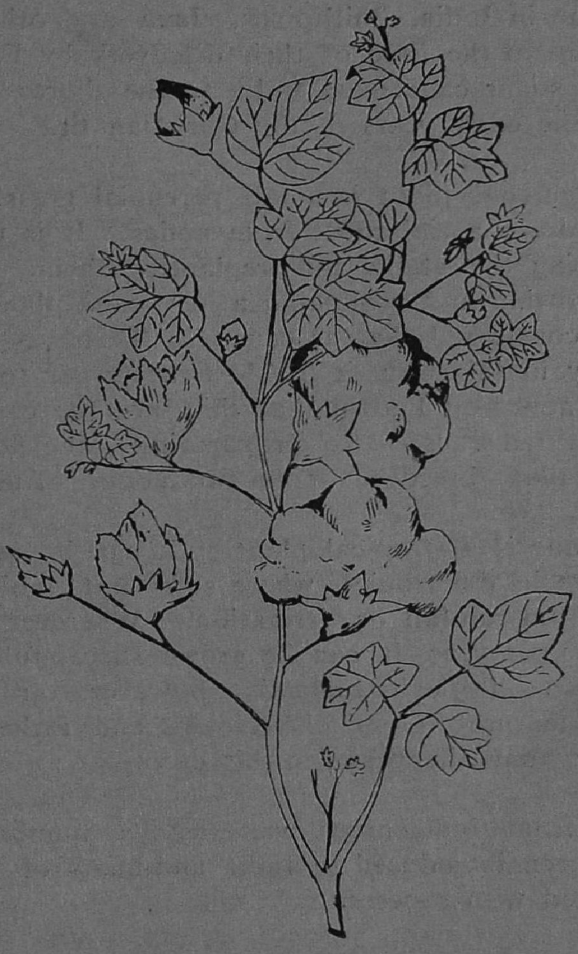
The cotton plant belongs botanically to the order Malvaceae. Most of the species are shrubs or small trees and are perennial in warm countries. A winter, however, kills the plant, and in the United States, new plants have to be raised from seeds every year. This practice is also carried out when cotton is cultivated in countries which have no winter, as it frequently gives better results than when the plants are allowed to grow for several years.

Cotton plants have large yellow, white or red flowers, and each flower forms a capsule or "boll". Although cotton is grown widely, most of the world's commercial supply is obtained from three countries—the United States, India and Egypt.

Cotton seed is sown and the young plants thinned out to some distance apart depending on local conditions. In about six months time the flower, and the pods or bolls follow in due course. When ripe they burst open displaying their white cottony contents. Picking is done by hand, care being taken to harvest the cotton with as little as possible of such extraneous material as pieces of pods, twigs, dry leaves, etc. The crop gathered is "seed-cotton", consisting of seeds with the fibre of lint firmly attached. In primitive countries, the lint is pulled off by

hand, but now this is done mechanically everywhere. As the result of ginning, lint and cotton seed are obtained separately.

Some of the most important cotton varieties are American cotton, (Gossypium hirsutum). Indian cotton (Gossypium herbaceum), and Tree cotton (Gossypium arboreum).



COTTON

SUGAR CANE

Saccharum officinarum, Linn.

GRAMINEAE

Eng. Sugarcane. Tam. **Karumbu**

Sugar has been made from sugar cane in India and Southern China since the earliest times. The industry was already an established one in India, Phillipines, Java and other islands of the East Indies at the time of their discovery by Europeans. The Arabs carried sugar cane from India to the shores of the Mediterranean in the early years of the Christian Era.

The sugarcane plant is a tall perennial grass. Its stem is solid and produces aerial roots from nodes. It is usually propagated by cutting the stalks and replanting them. Each bud is capable of growing and producing a new cane plant. For many years it was considered that as cane had been so long propagated asexually in this way, it had lost the power to produce true seeds. It is now well known that this not the case; but these true seeds are never used for propagating cane fields; they are used only by plant breeders for the production of new varieties.

Sugarcane is a tropical plant. It can be grown successfully anywhere in the tropics where sufficient moisture is available either from rainfall or irrigation. Wherever rainfall reaches 50 inches per year, it can be grown successfully in a great variety of soils. Typical canelands however, are heavy rather than light in texture. Good clay loams and rather heavy alluvial soil are among the best for this crop.

Apart from indigenious varieties, a number of foreign strains have been introduced in India and many of them are now being cultivated with success.

The following important varieties that are being cultivated are exhibited.

1) Saccharum spontaneum (wild cane) 2) Katha (3) Co 421 4) Co 419 5) Co 312 6) Vellai.

Sugar is extracted from the juice obtained by crushing the stems of the plant. The refuse obtained from the stem is called Megass or Bagasse. It is used as fuel, manure, torch, paper material and as fibre for ropes, mats and chairs.

COFFEE

Coffea arabica, Linn.

RUBIACEAE

Eng. Coffee. Tam. Kaapi

The people of Uganda were found chewing dried *robusta coffee* beans when the first explorers from Europe reached the country. It was seen that they took beans with them during long marches to help sustain their vigour. Since those early days, in one publication or another, several fanciful legends have been recorded. What most probably happened was that the Arab slave raiders in Africa observed how the local inhabitants used the beans or that the captured slaves took seeds of what is now known as Arabian coffee. It was therefore in South Arabia that coffee was first cultivated. It was during the Sixteenth and Seventeenth Centuries that the use of coffee gradually spread through Syria and Egypt to Turkey and then to Europe. In 1820 coffee was planted in Ceylon and India ; in 1700, in Brazil and in many other countries.

Of the four species of coffee grown for commerce, two are of worldwide importance. These are Coffea arabica and Coffea canephora. The other two are Coffea liberiea and Coffea excelsa. Coffee tree requires a deep rich soil. The soil should be well drained and not be flooded for long after heavy rain. Soils are either acid, neutral or alkaline. Coffee will grow well in neutral soils and also on acid soils provided the level of acidity is not high. Coffee plant is a shrub and it grows at an elevation of 1500 to 5000 feet. It requires 75° F and rainfall of 75 inches per year spread well over 9 months. Coffee tree requires

shade and for this purpose tall trees or thick leafy bushes are grown beside it. Coffee can be propagated in several ways by sowing seeds, by taking cuttings and grafting. Coffee is grown in Mysore, Coorg, Nilgris, Palani Hills and Kodaikanal Hills.

The ripe coffee fruit is called the 'cherry' and the enclosed twin seeds are called the 'berries'; when only one seed is is developed, it is known as 'peaberry'. Peaberry has more flavour and is therefore sold for a higher price.

Some samples of coffee seeds obtained from the Coffee Board are exhibited.

COFFEE

TEA

Camellia thea, Linn.

TERNSTROEMIACEAE

Eng. Tea. Tam. Theyilai

It was from China that tea came and its origin there is lost in the mist of legends, the most picturesque of which is that of an emperor who lived nearly 5000 years ago. This emperor set the good example to his subjects of boiling his drinking water. One day a few leaves from the branches burning under the water pot fell into the water, giving it a delightful scent and flavour. The branches were of the wild tea plant.

What is certain from the first book of the history of tea - the Ch'a Ching written by Lu Yu about 800 A.D. - is that tea was already used as a beverage in China in the Sixth Century. By the Sixteenth Century, Europeans came to know of tea. In 1610 the first consignment of tea reached Europe. In 1823 the wild tea plant was first discovered by Major Robert Bruce in Assam. Tea plantation was first started in India about 1834

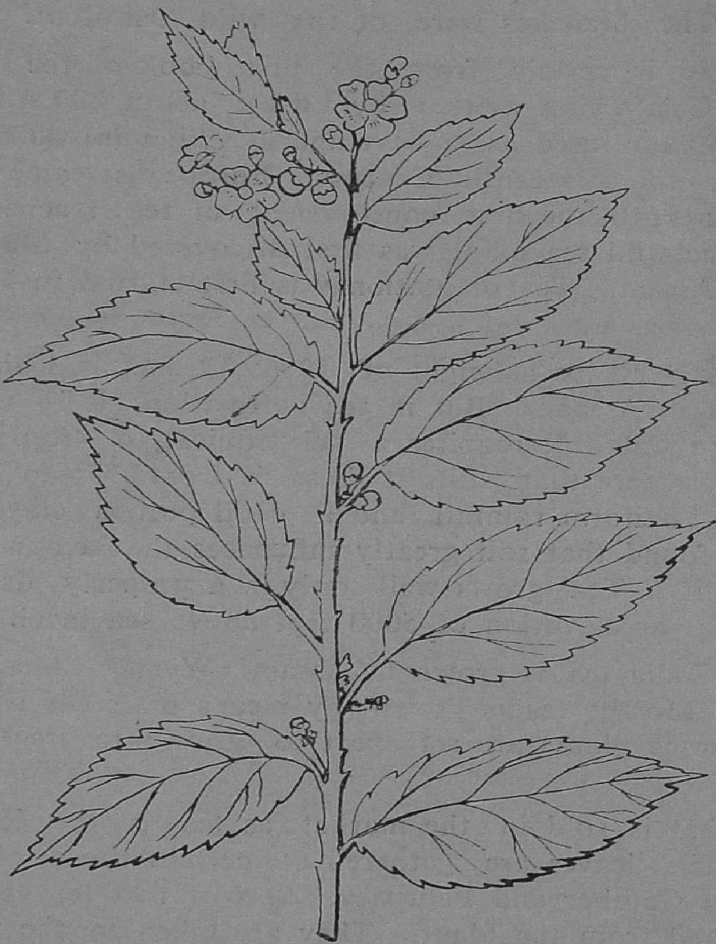
Tea grows to a height of 10 to 12 feet in China and 30 to 40 feet in Assam. But in tea cultivation, it is not allowed to grow so tall. It requires a sub-tropical to tropical climate. The temperature that suits it best is from 75° to 85° F. It requires a uniform rainfall and a good porous clayey soil. It has been found that soil greatly influences the flavour of the tea grown in it. Tea grows well only in a properly drained soil. It grows at an elevation of 5000 feet above sea level.

In India tea is grown in Assam, Wynad, Anamalais and Nilgiris. Mostly tea is grown by means of seeds and for this purpose some plants are set apart to grow into trees and form seeds.

What is sold in the market as tea is the leaf of this plant. The leaves are gathered at certain times of the year usually in October and February. Sets of two leaves and a bud are plucked from the plant. They are taken to the factory and

subjected to some processes and then brought out as the commercial tea. In the manufacture of black tea, the fermentation process is allowed to take place. While in the manufacture of green tea, fermentation is avoided.

Samples of the different kinds of tea are arranged in the showcase. The Orange Pekoe is supposed to be made up of buds. The next grade is called the Pekoe. Tea is adulterated wtih various, quite unrelated materials, like seed-husk and leaves of other plants. Also some profiteers suitably colour any waste matter like saw-dust and sell it as tea. A few adulterants of tea are dispayed



TEA

COCOA

Theobroma cacao, Linn.

STERCULIACEAE

Eng. Cocoa. Tam. Cocoa

The details of cocoa and its exact place of origin are not known except for the fact that it was under cultivation in South America by the natives long before the Christian Era. The cultivation of cocoa had extended from Mexico to Peru. When Columbus discovered the New World, he brought back with him to Europe many new and curious things, one of which was cocoa. Cortex in 1528 brought with him some beans of cocoa to Spain, but it took nearly fifty years before it could establish itself as a drink.

Cocoa can only grow at tropical temperatures. Soils rich in potash and lime are good for cocoa. An open sandy or loamy alluvial soil is considered ideal and the physical condition of the soils is equally important. It thrives well in about 80°F in the shade and the average of the maximum temperature suitable for cocoa is about 90° F and the minimum temperature about 70° F. The rainfall can be as low as 45 inches per annum or as high as 150 inches provided it is uniformly distributed. It is best grown at an elevation of about 1000 ft. to 7000 ft. above sea level.

The cocoa plant grows to 15 feet in orchards but in the wild state, from 25 ft. to 40 ft. Every year many thousands of blossoms come out but hardly, 1% become pods. Usually it takes six months for a bud to develop into a mature fruit. Each tree yields 20 to 40 pods, from the seeds of which rich cocoa powder is obtained. The seeds are covered with sand and allowed to ferment and later dried, and the seeds are later roasted and crushed when an oil called chocolate butter comes out. The remains are then ground giving the commercial product, cocoa. The cocoa butter is extensively used in confectionery, cosmetics, medicines, soap, etc.

Cocoa trees grow extensively on the African continent.

Nigeria has the biggest production. Two-thirds of the world cocoa is produced here. It has been tried experimently in India on the Western Ghats and the Nilgris.

RUBBER

Caoutchouc or Rubber is obtained from the latex or milky juice present in the tissues of a large variety of plants. It is supposed to have been discovered more than 400 years ago in South America. Rubber came to be of some importance when Mr. Macintosh in about 1820 used it for manufacturing water-proof garments. But it rose up in commercial estimation only when Mr. Thomas Hancock discovered that crude rubber, when cut up, pressed and submitted to heat, could be converted into a condition capable of being transformed practically into any shape or form. Later a method of vulcanising of rubber by heating and treating it with sulphur was found out. From that time onwards the demand for rubber steadily rose and it is wellknown to what an extent it is being used today.

In 1876 three kinds of rubber were introduced into India:

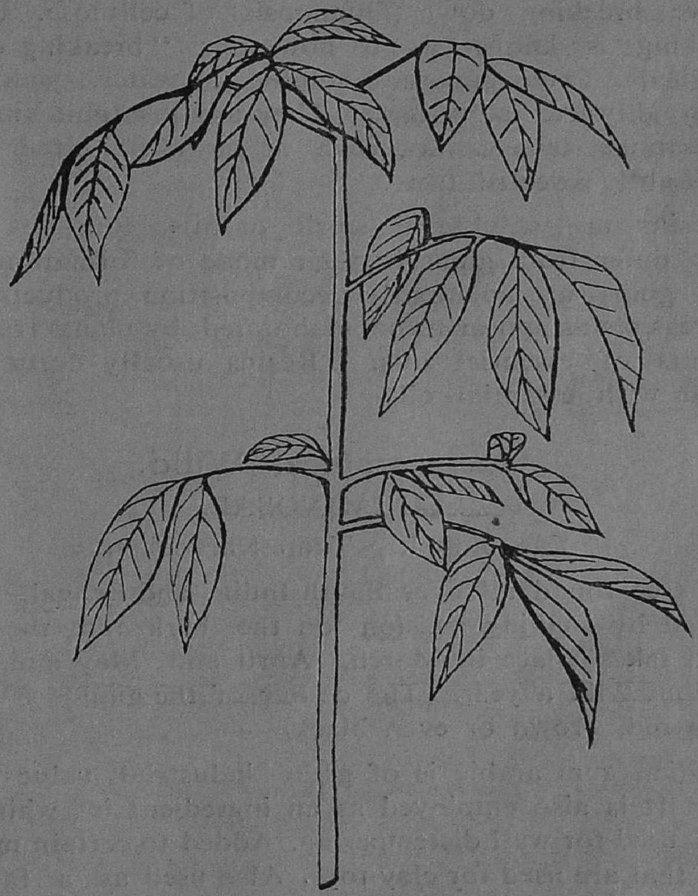
1. Para Rubber: *Hevea brasiliensis*, belonging to the natural order, Euphorbiaceae. It grows best in an alluvial soil and requires a rainfall of about 60 to 70 inches and a temperature varying between 75 and 95° F. It is cultivated in Kerala, Coorg, Anamalai, Nilgris, and Mysore.
2. India Rubber: *Ficus elastica*, belonging to the natural order, Urticaceae. It requires a rainfall of 70 inches. It thrives well in Assam and Darjeeling.
3. Cera Rubber, *Manihot glaziovi*, belonging to the natural order, Euphorbiaceae. It grows well in Nilgris, Mysore, and Coimbatore.

All these trees are big and grow to a height of 60 feet. The best rubber is pararubber. V-shaped incisions are made in the bark with special knives called tapping knives about six feet from the ground. The latex runs vertically between the cork and the wood and specially in the regions of cambium. At the bottom of each 'V' incision, a small aluminium cup or cigarette tin is hung. In this connection it must be said that only trees which have sufficiently developed a thick trunk are worthy of

being tapped. Tapping is done early in the day and in the evening and once begun, it will continue for about 16 to 18 days. Tapping is done once a year or two and in some places several times, depending upon the localities and the vigour of the trees. The collected latex is strained through a wire and poured into enamel trays of about 2″. Here they are exposed to the atmosphere and allowed to coagulate by adding to the latex some acid or alkali. Among acids, sulphuric and acetic are commonly used and among alkalies, alum is used.

The following are some of the forms of rubber exhibited:

1. Pararubber, 2. Curly scrap, 3. Shell scrap, 4. Estate-brown crepe 5. Plantation pararubber.



RUBBER

GUMS AND RESINS

The term "Gum" is loosely applied in commerce to a number of different products, which are better classified in the following groups :-

1. True gum e.g. *Acacia gum*, 2. Varnish resins e g. *Gum dammar*. 3. Gum-resins, mixture of gum and resin e. g. *Gum asafoetida*, 4. Dried plant juices e.g. *Gum opium*.

The process by which the gums are produced in plants is not yet thoroughly known. They appear to be formed by the progressive breaking down (Gummosis) of cellulose, but practically nothing is known as to how this "breaking down" is accomplished. True gums are soluble in water, yielding clear viscid or jelly-like solutions. They are insoluble in alcohol. They are almost tasteless, or have at the most either a slightly acid or slightly sweetish taste.

Resins are soluble in spirit or oils, but not in water. They also differ from gums in their mode of formation in plant. The true gums are apparently decomposition products of cellulose whereas resins appear to be elaborated by plants from certain constituents of essential oils. Resins usually occur in plants associated with essential oils.

Acacia arabica, Willd.

LEGUMINOSAE

Eng. Babul. Tam. Karuvelam

A tree found all over South India and Bengal. The gum is obtained by making incision on the bark and the sap. The exudation takes place in March, April and May and each tree yields about 2 lb. a year. The colour of the gum is a pale straw colour to red, brown or even black.

Indian gum arabic is of great industrial value in calico printing. It is also employed as an ingredient in whitewash and in paints used for wall distempering. Added to certain mortars and to paints that are used for clay toys. Also used as a famine food.

Acacia catechu, Willd.

LEGUMINOSAE

Eng. Catechu Tree. Tam. Kasukatti

A tree distributed throughout India. The gum is of a pale yellow colour and occurs in tears of one inch in diameter. The gum is soluble in water and sweet to taste. It is the best gum in South India. It is used in calico printing and in paints used for wall distempering.

Albizzia lebbek, Benth.

LEGUMINOSAE.

Eng. The Siris Gum. Tam. Vaagai

A large, spreading, beautiful tree found in the Himalayan tracts and South India. The gum is not completely soluble in water. It forms a jelly with water and is used in calico printing and in the preparation of gold and silver leaf cloths.

Anacardium occidentale, Linn.

ANACARDIACEAE.

Eng. The Cashew Nut. Tam. Munthri.

A tree common in the districts of South India. The gum occurs in large stalactitic pieces; is yellow or reddish and is only slightly soluble in water. It is obnoxious to insects. Used as an incense.

Bombax malabaricum, DC.

BOMBACACEAE.

Eng. Silk Cotton Tree. Tam. Elavam

A deciduous tree, common throughout the hotter forests of India. The gum is dark brown. Incisions on the healthy plant do not cause gum to flow. This flows from portions of the bark that have been injured by decay or insects. It possesses astringent properties and is used in in dysentery, diarrhoea, etc.

Canarium strictum, Roxb.

BURSERACEAE.

Eng. Black Dammar. Tam. Karuppu Kungilium

It is a very tall and large deciduous tree of Western and

Southern India. The resin is obtained in the following manner. Vertical cuts are made on the bark and a mass of brushwood fired around the base of the trunk. This causes the resin to flow.

It is employed in the manufacture of bottling wax for varnishes. In medicine, it is used as a substitute for Burgundy pitch in the manufacture of medical plasters. Also used in the manufacture of varnish.

Cochlospermum gossypium, DC.

BIXACEAE

Eng. Buttercup Tree Tam. Tanaku

A medium-sized deciduous tree, distributed throughout India. A clear, white gum exudes from the bark; it is known as 'Katira gum'. It is used in the manufacture of cosmetics, for thickening ice-creams, and by book binders and shoe makers.

Commiphora mukul, Engl.

BURSERACEAE

Eng. Gum Gugal. Tam. Maisachi

A native of Western India and Rajastan. A small spiny tree of four to six feet. The gum is brittle, red, yellowish or brown, transparent and has a pleasant odour. Soluble in potash and contains resin-gum *bassorine* and a volatile oil.

Feronia elephantum, Correa.

RUTACEAE

Eng. Wood Apple. Tam. Vilaam Maram

It is a tree with irregular branching and common throughout Southern India. The gum is yielded in large quantites and is fully soluble in water. It occurs in irregular semi-transparent reddish-brown tears. The gum is used by dyers and painters, especially miniature painters. It is also used in making ink and certain varnishes and in preparing a fine kind of white-wash.

Ferluia alliaceae, Boiss,

UMBELLIFERAE

Eng. Asafoetida. Tam. Perungayam

A shrub which grows to a height of 2 to 4 feet. It is a native of Persia.

This plant is the chief source of the asafoetida used in India. The gum-resin is obtained by wounding the upper part of the root from which a small quantity of gum-resin escapes and is collected. The living root is then sliced daily or once in two or three days with the exudation adhering to it till it is exhausted. The whole mass is then packed in a skin. The gum-resin is carminative and antispasmodic and from time immemoriol it has been held in great value by Indian doctors. It is largely used as condiment.

Garcinia morella, Desn.

GUTTIFERAE

Eng. Gamboge Tree. Tam. Thamal

An evergreen tree found in South India. The "Gamboge" of medicine and the arts is obtained from this gum-resin. The tree must be ten years old for tapping. The gum-resin is of a rich brown colour, dense and brittle. It si tasteless at first and then acrid. It dissolves in ammonia, and this solution produces a yellow and red dyes with zinc and lime mordants. The Hindus use it as a 'thilak'. Artists employ it as pigment for their water colour drawings.

Gardenia gummifera, Linn.

RUBIACEAE

Eng. Gummy Cape Jasmine. Tam. Dhika-malli

A small tree, common in South India. The gum-resin is exuded from wounds in the bark and also from the leaf buds. This is transparent and bright yellow in colour. It is used in the treatment of ulcers and to keep off flies and worms from ulcers.

Gardenia lucida, Roxb.

RUBIACEAE

Tam. Kumbi

A small deciduous tree, common in South India. The gum is exuded from wounds of the bark or of the leaf buds. The gum is hard, opaque and olive green in colour and has an unpleasant smell. It is used in treating ulcers.

Lannea grandis, Engl.

ANACARDIACEAE

Eng. Wodier Wood. Tam. Othiyam

It is a large tree found in South India. The gum is obtained by making shallow cuts all over the bark. The gum is brown, clear and brittle. It is used in calico printing and in paper sizing. It is also used by weavers in cloth printing. It is employed in whitewashing and in pasting. It is also used for making inks and is extensively used in confectionery.

Pterocarpus marsupium, Roxb

LEGUMINOSAE

Eng. Gum-kino Tree. Tam. Vaengai

A large deciduous tree found in South India. The manufacture of kino from the juice is done in the months of February and March. A longitudinal cut is made with a knife through the bark of the tree down to the cambium. A bamboo tube is then fixed at the bottom of the main incision to catch the juice. The flow of the juice ceases in 24 hours. Then these are collected and boiled to remove the impurities and exposed to sun to dry. It is called the red gum, "kino" of commerce. It is extensively used as a medical gum and is also used in the preparation of some European wines.

Shorea robusta, Gaerten F.

DIPTEROCARPACEAE

Eng. Sal Tree. Tam. Kungilium

A large gregarious tree, abundant in the forests of South India. When tapped, the tree yields a resin in large quantities.

The resin is whitish, aromatic and transparent. It is used for caulking boats and ships, as incense and in medicine. It is used for hardening soft waxes, in the manufacture of shoe polishes, carbon papers, typewriter ribbons, etc., and in the production of inferior qualities of paints and varnishes.

Soymida febrifuga, A. Juss.

MELIACEAE

Eng. Indian Red Wood. Tam. Shemmaram

It is a large deciduous tree, distributed in the dry forests of South India. The gum occurs in large pieces and affords good mucilage.

Vateria indica, Linn.

DIPTEROCARPACEAE

Eng. Indian Copal Tree. Tam. Vellai Kungalium

A large handsome evergreen tree, found in South India. It yields a valuable oleo-resin that is obtained from the trunk. When soft, the resin is known as piney varnish; when hard as dammar or Indian Copal. It is used for making varnish for furniture; it is also used for varnishing pictures and anatomical preparations, for making candles which diffuse a pleasant smell. A mixture of this resin and fish oil is used for caulking boats.

RICE

Oryza sativa, Linn.

GRAMINEAE

Eng. Paddy. Tam. Nel

Rice is the most important food crop of India and also Asia. It is of great antiquity, and therefore finding the period of origin or introduction in different countries of Asia presents difficulties. It is recorded in Chinese texts that the crop was being grown in China in about 2800 B.C.; this is the earliest mention of rice in any writing. In India, rice has been cultivated since ancient times. Carbonised paddy grains were found in excavations at Hastinapur (Uttar Pradesh) at a site dated between 1000-750 B. C., and are the oldest rice specimens yet known in the world. References to rice crop and cultivation are found in the

Rig Veda, the oldest literary record of the Hindus. It is believed that rice cultivation spread to the North from the South.

Rice crop is grown under diverse conditions in the country from almost sea-level to elevations of 6000 ft. The soils vary from loams and clays to shallow laterites, with reaction ranging from extremely acidic to highly alkaline. Cultivation is done in 15 feet to 20 feet deep water ; at others it is carried on with a meagre rainfall of 20 inches. In some areas, a single crop is taken once a year ; in other areas, three crops are grown in succession annually on the same land. The crop may be of 70 days duration or may take six to seven months to mature. It may be grown in summer or in autumn, or in winter. The crop is grown in widely varying conditions of rainfall, altitude and climate.

Rice belongs to the genus *Oryza* of the sub-tribe *Oryzinea* in the family *Gramineae*. The genus *Oryza* includes 24 accepted species of which 22 are wild and two, *O. sativa* and *O. gluberrima* are cultivated. Rice is the principle food of nearly half of the world's population. It is predominantly an Asian crop, 95 per cent of it being produced and consumed in South East Asian countries extending from Indo Pakistan sub-continent to Japan. The Indian Union contains a third of the rice area and its output of clean rice amounts to about 31 percent of the world production. At present there are over 280 varieties of rice grown in India. In this show case there are 47 strains of paddy exhibited. The strains are from Coimbatore, Aduthurai, Palur, Pattambi and Andhra.

The characters of the strains, a brief note :

Co 5 : Winter crop, 180 days.
Co 10 : autumn spring, 110 days stands submersion to 3 to 4 ft.
Adt. 3 : autumn, 95 days.
Adt. 12 : autumn, 115 days, stands irregular water supply.
Geb. 24 : winter, 150 days. blast resistant.
Ptb. 9 : autumn, 145 days, non-shedding and non-lodging.
Ptb. 15 : winter, 165 days, grown in submergible areas, tall and [stiff straw.
Asd. 5 : 135 days.
Mtu. 11 : winter, stands submersion and indifferent water supply

Mtu. 10: winter, 170 days, fine, short-growing, non-lodging suited to rice soil.

Baasmath: winter, 180 days, superfine, long, slender grains, scented (pulav rice).

MILLETS

The term 'millet' is employed to include a large number of cereals and forage grasses, the seeds of which are usually small when compared with other cereals such as wheat, barley and oats. It has been estimated, however that fully one-third of the world's inhabitants employ millets as a regular article of food.

Panicum crusgalli, Linn.

GRAMINEAE

Eng. Shama Millet Tam. Kudiraivaali

The plant is a tufted annual extensively cultivated in many countries. It is cultivated as a rainy season crop over a large area in South India. The culms of this millet are erect from 2 to 4 feet height. This is the quickest growing of all the millets and in some localities, can be harvested within six weeks of being sown. It is sown in April and May and cut in June and July. Its nutritive value is not high. It is either prepared as rice or boiled with milk or eaten merely parched.

Panicum miliaceum, Linn.

GRAMINEAE

Eng. Common Millet, Tam. Samai

The common millet is generally regarded as the true millet. It has been cultivated in Europe from the most remote times, and there is direct evidence that it was largely used by the Swiss lake dwellers. The origin of this millet is very uncertain although it has been found growing in Southern Europe, Asia and Africa. There is no authentic instance of its having been found truly wild.

It is an erect annual grass 2 to 3 feet in height, cultivated in many parts of India. It is sown in March and the crop ripens towards the end of May. The grain is considered to be digesti-

ble and nutritious and in many places is eaten unground and cooked like rice. Prepared with milk and sugar, it constitutes a favourite food. Sometimes it is used as bread or in the form of *chappattis*.

Paspalum serobiculatum, Linn.

GRAMINEAE

Eng. Kodo Millet. Tam. Varagu.

This is an erect grass growing to 2 feet in height. It is extensively cultivated during the rainy season in most parts of Southern India. It grows readily on the poorest soils and is sown after the rains and harvested in October. A large number of poor people consume it as food, but the grain connot be considered a wholesome article of diet.

Pennisetum typhoideum, Rich.

GRAMINEAE

Eng. Bulrush Millet. Tam. Kambu.

A tall erect annual 8 to 20 feet in height, adapted to arid conditions. It is generally grown in poor soil. It is African in origin. The spikelets of flowers are crowded into compact cylindrical spike, sometimes over a foot long. It is cultivated throughout India, Egypt and Africa. The seeds are sown in June and the crop ripens towards the end of September.

The grain is supposed to cause ‘heat’ in the body and is therefore consumed in cold weather in Northern India. The flour, made into cakes or bread with butter-milk, is a staple food for many. It is more nutritious than rice. The following varieties are exhibited.

Pennisetum typhoideum, Co 6.
Pennisetum typhoideum, X 3.

Setaria italica, Beauv.

GRAMINEAE

Eng. Italian Millet. Tam. Thenai.

Italian millet is more or less extensively grown throughout temperate Europe, India, China, Japan, North America, the

United States and Canada. The abundance of the grain found in the lake dwellings clearly indicates its importance as food in pre-historic times, and there are historical records of similar uses in China nearly 3000 years before the Christian era, and it is one of the five sacred plants of China. It is an annual grass, three to five feet in height. It is frequently grown as an intermediate crop; in some districts it is sown in April and May and cut in June and July, in others from June to September and from September to January.

This millet is generally regarded as nutritious and digestble. It is eaten in the form of cakes or of porridge. When boiled with milk, it constitutes a light and pleasant meal for invalids.

Sorghum vulgare, Pers.

GRAMINEAE

Eng. Great Millet. Tam. Cholam.

A tall handsome grass, the great millet is a very extensively cultivated cereal. It is generally regarded as a native of South Africa where it is known as Kaffir corn taking its name from the native tribe. In Hindi it is known as jowar. A reference to jowar was made in the administration report of Akbar (Ain-i-Akbari) in the year 1560, and its price was quoted among the autumn crops. In India, next to paddy, this is the most widely cultivated cereal. It is a rainy crop and is generally sown during the rainy season. It thrives well on ordinary soils, but grows best on good loam, affording three or four cuttings a year. It is considered in South Africa to be one of the most drought-resisting crops.

Zea mays, Linn.

GRAMINEAE

Eng. Maize. Tam. Makkacholam.

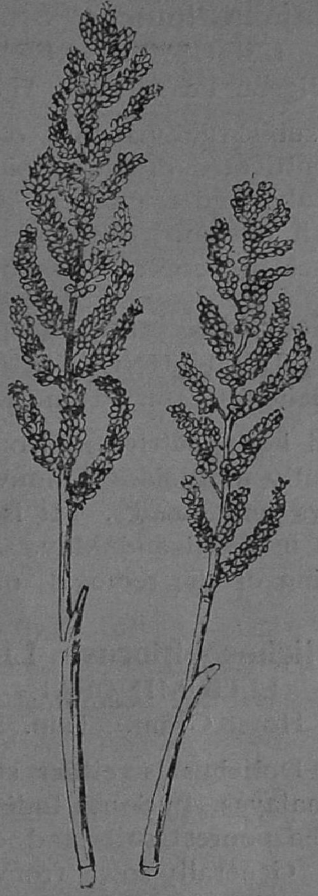
This valuable foodstuff is the grain of a gigantic grass known as *zea mays*. The original home of this plant is America. There are various theories regarding the origin of maize. The recent significant discovery of fossil pollen of maize from Mexico city by Barghoorn in 1954, points to the existance of the plant in

the valley of Mexico about 8,000 years ago. Besides the evidence from fossil pollen, findings based on archaeological and geological excavations and radiocarbon determinations of charcoal associated with the prehistoric corn cob recovered from Bat Cave in New Mexico (Mangelsdorf, 1958) indicates that the plant must have originated at least 5,600 years ago.

"The monograph by Mangelsdorf and Reeves on the origin of maize may be considered definitive. They visualize maize "as a wild pod corn originating from a remote Andropogonaceous ancestor which gave rise on the South American continent to a single species *Zea mays* and on the North American continent to a more variable genus, *Tripsacum*." The two genera proceeded along parallel evolutionary lines, but "while Zea confined itself to or became reduced to a single species and remained a plant with low chromosome numbers and an annual habit of growth, devoting most of its energy to reproduction by seed."

Maize is an annual grass reaching, under average conditions of soil and climate, a height of from six to fifteen feet. The seed is generally sown at the beginning of May. It is extensively cultivated throughout the world and forms an important food article. Maize, however, is an extremely variable plant, and it is said that over 300 recognisable varieties are known. There is also great variety in the shape, size and colour.

Maize is a most valuable article of food for men. It is said to be more nutritious than most other cereals including wheat. It is very rich in nitrogenous matter and fat. The flour is largely used as substitute for arrowroot for making biscuits. In many parts of the world the young unripe cobs which are very sweet are boiled and form a favourite vegetable. The seed also contains a valuable oil known as maize-oil, which is largely used in the United States as a table oil and for making soap. Maize finds extensive and increasing use in industry such as in the manufacture of corn starch and its derivatives, glucose, corn sugar, dextrins, industrial alcohol and alcoholic beverages.



SHAMA MILLET

PULSES

These are all members of the pea family, and are among the most importrant of the foodstuffs. They are all cultivated and used in large quantities in all parts of the world. In India and China, where relatively speaking, very little meat is eaten, pulses are an absolute necessity of life, constituting the chief nitrogenuous food. Before the spread of potato, pulses formed a great part of the foods of the working classes of the United Kingdom and other parts of the world.

Cajanus indicus, Spr.

LEGUMINOSAE

Eng. Pigeon Pea. Tam. Thovarai

It is an erect sub-shrubby plant, often about six feet in height. It is widely cultivated in the tropics and sub-tropics. It is grown in June or July and reaped in December to March. Commonly grown with cotton. Used as food to a very large extent by all the classes of people in India.

Cicer arietinum, Linn.

LEGUMINOSAE

Eng. Bengal Gram. Tam. Kadalai

It is an annual herb cultivated from an early period in warm countries especially in India. Gram was known to the ancient Egyptians, Hebrews and Greeks. It is sown in August or September and reaped in April and May. The seeds after parching, grinding or steeping or the removal of the husks, is used as food.

Dolichos biflorus, Linn.

LEGUMINOSAE

Eng. Horse Gram. Tam. Kollu

This species of Dolichos is either sub-erect or twining in habit. Wild in the Himalayas. In South India it is a very important crop. It grows on the poorest soils and does not require much irrigation or manure. Generally sown from August to November and reaped from November to February. A very good cattle food, very largely used as horse food. Used very largely by the poorer classes as it is a cheap pulse.

Dolichos lablab, Linn.

LEGUMINOSAE

Eng. Lablab-Bean. Tam. Motchai

A true native of India ascending to 6000 feet. An annual crop in cultivation. Grown from June to August and reaped from October to March. Used as a green vegetable and also a fodder material. Its ripe seeds are used in culinary preparations.

Phaseolus lunatus, Linn.

LEGUMINOSAE

Eng. Lima Bean.

This is a tall twining biennial herb. Cultivated in Assam, Bengal and Punjab. This is one of the species of *Phaseolus* which sometimes exhibits marked poisonous properties. Used as food for cattle. It is not very much used as food because it has often been shown that it contains the poisonous Prussic acid.

Phaseolus mungo, Linn.

(Variety—Radiatus)

LEGUMINOSAE

Eng, Green Gram. Tam. Pachai Payaru

It is a native of India and has been cultivated for some 3000 years. The sowing takes place at the commencement of the rains and the crop ripens in October and November. The green Pods are eaten as vegetable and the ripe grain is the most esteemed pulse in India.

Phaseolus mungo, Linn.

LEGUMINOSAE

Eng. Black Gram. Tam. Oolundu

A native of India, it has been cultivated from time immemorial. The seeds vary in colour and size. Cultivated in most of the rice-growing districts of India. It is the most esteemed pulse of South India. Used for making cakes and other articles of food.

Pisum sativum, Linn.

LEGUMINOSAE

Eng. Pea. Tam. Pattani.

This genus comprises the grey or field pea and the common garden pea. They are abundantly cultivated in South India, chiefly in Nilgris and Mysore. The pea is an annual herb and prefers havy ground and receives little cultivation, manure or irrigation. The growing takes place in October and November and the crop is cut in February, March or April. The green pods are largely eaten before the general crop is cut. The green pods and seeds are eaten as food.

Vigna catiang, Walp.

LEGUMINOSAE

Eng. Cow Gram. Tam. Karamani

A sub-erect herb commonly cultivated in all the hot districts of India. It is a climbing herb. The white seeded kind is generally considered the best. The pods are often gathered when green, cut to length, cooked and eaten like ordinary " kidney-beans ". The seeds are also largely used as food in tropics.

OILS AND OIL SEEDS

It will be convenient to consider oils under the following heads :

(1) Volatile oils (2) Drying oils (3) Semi-drying oils (4) Non-drying oils and (5) Vegetable fats.

1. Volatile oils will evaporate on exposure to air. These are usually prepared by a process of distillation in steam. They are used in perfumery and as flavouring agents.

The other four types of oils are obtained by (1) expression when the material is crushed in a press and the oil is squeezed out, (2) by extraction when the oil is dissolved out by suitable solvent.

Anacardium occidentale, Linn.

ANACARDIACEAE

Eng. Cashew Nut. Tam. Munthiri

An erect, spreading evergreen tree, growing upto a height of 20 feet. It is an American plant introduced into India from Brazil by the Portuguese. The oil from the kernels is very tasteful and edible, but very costly. The pericarp of the seed which is partly outside the fruit contains an acrid oil, black in colour. It is a drying oil. In India the oil is employed as a waterproofing agent, and as a preservative in the painting of boats, fishing nets and light woodwork. The shell oil is also distilled, and polymerization products of the distillate with other materials are used in insulating varnishes, typewriter rolls, oils and acid proof cold-setting cements, industrial flooring tiles and automobile breaklinings.

Andropogon citratus, D. C.

GRAMINEAE

Eng. Lemon Grass. Tam. Karpura Pullu

A large coarse grass, common in gardens all over India. The oil is used to adulterate verbena oil and largely to perfume soaps and vaseline, It is also used in most of the native perfumery.

Andropogon schaenanthus, Linn.

GRAMINEAE

Eng. Rusa Grass

This grass grows wild in Central India and Punjab. The oil is used in perfumery, chiefly as an adulterant for *attar* of roses. It is also employed in native medicine as liniment in chronic rheumatism and neuralgia.

Arachis hypogaea, Willd.

LEGUMINOSAE

Eng. Groundnut. Tam. Verkadalai

A small-branched herb which grows erect or trails on the ground. After fertilisation the base of the ovary develops a long stalk which pushes the ovary into the soil where it begins to develop into a pod maturing in about two months. Brazil is regarded as the home of the ground-nut but it is now cultivated in all tropical and sub-tropical countries. Groundnut oil is predominantly an edible fat. Large quantities of groundnut oil are used in India for the manufacture of vanaspathi. In Europe and America, the refined oil is used as edible fat and for the manufacture of margarine. It is also a very good salad oil.

In veternary medicine, it is used as a nutritive laxative and emollient. The lower grade of oil and soap stocks obtained during refining are used in soap-making. It is used to a limited extent in the manufacture of cosmetics and for leather dressings. It is also employed as a substitute for diesel oil in internal combustion engines with only minor modifications of the engines.

Argemone mexicana, Linn.

PAPAVERACEAE

Eng. Mexican Poppy. Tam. Brammadandu.

A strong prickly branched glabrous annual. A native of Jamaica found throughout India on wasteland upto a height of 5000 ft. The seeds yields a clear, yellow, semi-drying bitter oil.

It is largely used as a luminant, and in the manufacture of soap; to a certain extent it is used as substitute for linseed oil. In America it is used by painters, and in South Africa, as a preventive of white ants. It has also many medical uses, especially for syphills and many skin diseases.

Azadirachta indica, A. Juss.

MELIACEAE

Eng. Neem. Tam. Veppamaram.

Neem oil was the oldest medical oil. The earliest record of neem is found in the Arthasasthra. Neem oil is extracted by crushing neem seed kernels. The oil is deep greenish yellow or brown in colour and of a strong garlic odour. A common tree found throughout India. In villages it is used for burning lamps. The refined oil is used in the manufacture of soaps, cosmetics, disinfectants and emulsifying agents for insecticides. It is also used in medicine for curing skin diseases, ulcers, rheumatism, sprains etc., and as an antiseptic.

Carthamus tinctorius, Linn.

COMPOSITAE

Eng. Safflower. Tam. Kusamba.

An erect annual herb, 1-5 ft. high. Said to be indigenous in the Indian islands, cultivated all over India. The seeds are of value for the oil they yield. It is used as a luminant and preservative of leather articles. It is a drying oil. It is very useful as a raw material in paint, varnish and allied industries. It imparts durability and weather resistance to paints made with it. It is especially useful for white paints and enamels used in interior decoration as it does not yellow with age.

Celastrus paniculata, Willd.

CELASTRACEAE

Tam, Valuvai.

A scandant shrub of the Himalayas and Assam, ascending to 4,000 ft. also found throughout the hilly parts of India. The oil extracted from the seeds is deep scarlet or yellow in colour. Used in medicine for external application. Also burnt in lamps

and employed in certain religious ceremonies. The principal use of this oil is in the production of 'oleumnigram' of pharmacy. This is mixed with benzoins, cloves, nutmegs and mace and distilled. The resulting product is *oleum nigrum* which is useful in the treatment of beri-beri.

Cocos nucifera, Linn.

PALMAE

Eng. Coconut. Tam. Tennai

A tall and stately palm. Original home not known; common throughout the sea coast regions of India. The dried kernel is the 'copra' of commerce. The oil extracted from it is of great commercial and industrial value. It is extensively used in the manufacture of soap, hair oil and food products. It is also used as a luminant and a cooking oil.

Croton tiglium, Linn.

EUPHORBIACEAE

Eng. Croton plant. Tam. Neervalam

A small tree with a few spreading branches found in most parts of India. The seeds yield the well-known croton oil. It is considered to be one of the most drastic purgatives known. The oil is a good remedy for external application in rheumatism and indolent tumours. It is used as a constituent of ruberfacient liniments and in the treatment of of pneumonia. It is occasionally employed as ointment for blisters in veterinary practice.

Eriodendron anfructuosum, D. C.

MALVACEAE

Eng. White Silk Cotton Tree. Tam. Ilavam

A middle-sized deciduous tree, common in forests throughout the hotter parts of India and also cultivated. The seeds yield 28 % of an oil which resembles cotton seed oil. The oil is used in Holland as food and in the manufacture of soaps.

Hydnocarpus wightiana, Bl.

BIXACEAE

Tam. Neeradimuthu

A common tree found along the Malabar coast. A brow-

nish - yellow or soft cream - coloured fat is obtained by cold expression from fresh, ripe seeds. The oil is mainly used in the treatment of lepromatus leprosy and is effective, in the early cases, in decreasing the size of nodules, anaesthetic patches and skin lesions.

Jatropha curcas, Linn.

EUPHORBIACEAE

Eng. Physic Nut. Tam. Kattamanakku

A soft-wooded shrub, evergreen tree. Indigenous in America, grown as a hedge plant, cultivated in most parts of tropical India. The seeds are rich in oil which has many uses. It is a semi-drying oil. The oil is known as "Jatropha oil", contains croton resin and is used by the Javanese as a stimulant for the growth of hair. The oil burns without smoke and so is useful as an illuminant. Its chief use is in the manufacture of hard soap and candles. It is also employed as a lubricant. In England and other countries the oil is used for wool-spinning.

Linum usitatissium, Linn.

LINACEAE

Eng. Linseed. Tam. Allividhai

An annual herb cultivated throughout India. There are two varieties, white and red. The quality of oil from the white seed is generally superior. The colour of the linseed oil varies from light to a brownish yellow. The drying property is considerably increased by heating the oil with certain metalltic salts. The principal uses of boiled linseed oil are for making paints and varnishes, in the preparation of printer's ink and in the manufacture of linoleum.

Madhuca latifolia, Roxb.

SAPOTACEAE

Eng. Mohua Tree. Tam. Iluppai.

A large deciduous tree with a short but straight trunk. Indigenous in the Sub-Himalayan tract; cultivated throughout India. The fruit contains oil. The oil is the Mohua butter of commerce; it is edible. It is used in cooking and for the burning of lamps. It is also used in adulterating ghee. It is also used in the manufacture of margarine and soap.

Mimusops elengi, Linn.

SAPOTACEAE

Eng. Indian Maddar. Tam. Maghizam.

A middle-sized or large evergreen tree. Found all over

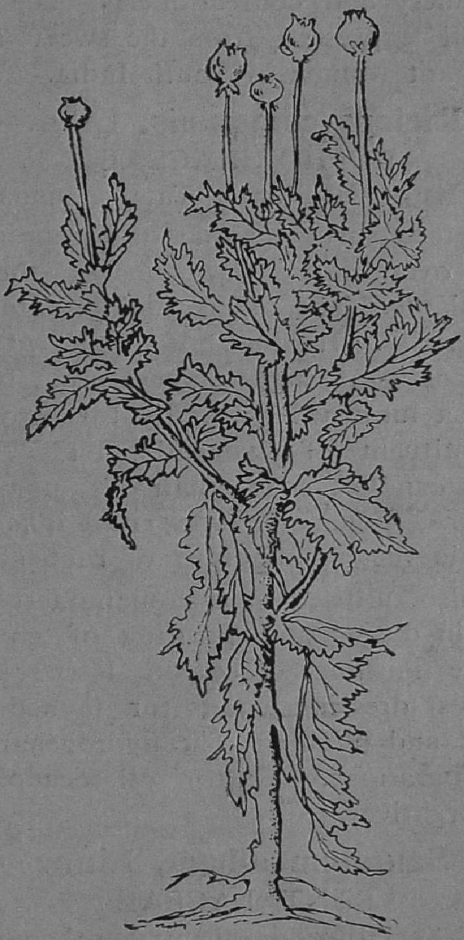
India. The oil extracted from the seed is used in cooking and as a luminant. Painters also make use of the oil.

Papaver somniferum, Linn.

PAPAVERACEAE

Eng. Opium Poppy. Tam. Kasakasa

An annual herbacious plant cultivated throughout India. Poppy oil is derived from the seeds of the opium poppy. The oil is almost as good as olive oil for culinary purposes. It is also used for lamps and is much prized by artists.



OPIUM POPPY

Prunus amygdales, Baill.

ROSACEAE

Eng. Almond. Tam. Badam

A moderate-sized tree cultivated in Kashmir and Punjab. The almond yields two distinct oils-an essential and a fixed or fatty oil. The latter oil is obtained by expression from either bitter or sweet almonds. The essential oil is obtained by submitting bitter almond cake to distillation with water either alone or more commonly with salt. An essence prepared from it is largely used in perfumery and confectionery. The oil has medical properties. The oil expressed from the sweet almond is taken internally by pregnant women in South India.

Ricinus communis, Linn.

EUPHORBIACEAE

Eng. Castor Oil Plant. Tam. Amanakku.

A tall evergreen shrub, annual or perennial. It is extensively cultivated all over India. It is one of the most valuable oil seed-bearing plants. The oil is highly valuable both medicinally and industrially. It does not solidify at low temperature and retains its viscocity at high temperature. It is a non-drying oil. It is used as a lubricant especially for aero engines, and is an important constituent of hydraulic fluids. It is also largely used for making candles, soaps, hair oils, pomades, perfumery, ointments, flypoisons, fly papers, typewriting inks, artificial leather and linoleum and in the manufacture of rubber substitutes.

The oil is also utilised in the manufacture of Turkey red oil which is used in dyeing and printing of cotton and woollen fabrics, and in the finishing of cotton, linen, silk and leather. It is one of the best dressing agents for tanned hides and skins to make them soft and pliable. The hydrogenated oil is used in technical wax preparations. Castor oil occupies a prominent position among purgatives.

Santalum album, Linn.

SANTALACEAE

Eng. Sandalwood. Tam. Santhanam.

A moderate sized evergreen tree. Indigenous in South India

From the heartwood an essential oil is distilled and also from the roots. The oil is largely used in perfumery and toilet preparations and in scenting inferior wood. The oil is also useful as an insecticide and an insect repellent. The oil from the wood has medical uses.

Semecarpus anacardium, Linn.

ANACARDIACEAE

Eng. Marking Nut Tree. Tam. Sherangkottai

A medium sized tree found all over India. The seed yields an oil which is used as a preservative against attacks of white ants and as a lubricant. The oil is also used in medicine.

Sesamum indicum, Linn.

PEDALIACEAE

Eng. Gingelly. Tam. Ellu

An erect pubescent annual 1 to 3 feet high. It was cultivated from time immemorial. Largely cultivated throughout India, being grown as an autumn or even as a winter crop in the warmer parts of the country and as a summer one in the colder areas. There are two well marked varieties of the seeds, black and white. The black seeds furnish a superior oil and are more cultivated. The oil is used as food by almost all the people of South India and a large quantity is used for anointing the body. The oil is also used for medicinal purposes.

Vateria indica, Linn.

DIPTEROCARPACEAE

Eng. Indian Copal Tree. Tam. Vallay Kungiliam

A large handsome evergreen tree. Found in the Western Ghats ascending to 4000 ft. From the seed is obtained a vegetable butter, known as "Malabar tallow". It is extensively used for burning in lamps, as a substitute for ghee and in the manufacture of soaps and candles. The refined fat is used in confectionery.

CONDIMENTS AND SPICES

A large number of vegetable products are by themselves of little or no nutritive value. But they have been used by man to render ordinary food stuffs more palatable. Such substances are known as spices and condiments.

The history of cultivation and use of spices and condiments is perhaps the most romantic among those of vegetable products. From the earliest known eras the cultivation of spices was eagerly sought after in all parts of the world. The old explorers who were searching for gold, paid almost equal attention to drugs and spices. It was the pursuit of these, as much as anything, that led men to the first rounding of the Cape of Good Hope and to the colonisation of the East Indies.

Spices form an important class of vegetable products, being valued in cookery, confectionary, in the preparation of beverages and liquours, cosmetics and in perfumery. Several of them are of special importance in medicine, on account of their effect in aiding the digestion by increasing the gastric juices. The appropriateness of spices to sacred uses, as burning of incense, has long been recognised. It is recorded that spices were used for the funeral pyres of Egyptian kings. Nero had burnt at the obsequies of his wife "a quantity of *cinnamon* and *cassia* exceeding the whole importation in Rome for one year." Not the least virtue of certain spices is their effect in sweetening the breath, more especially in countries where betel chewing is practised.

Allium cepa, Linn.

LILIACEAE

Eng. Onion. Tam. Vengayam

It is a bulbous herb extensively cultivated all over India. Onions are extensively used as food by most of the people. Onions also make excellent pickle.

Allium sataivum, Linn.

LILIACEAE

Eng. Garlic. Tam. Vellaippoondu

Garlic appears to have been one of the plants cultivated in the earliest times. It was well known in ancient Egypt. A bulbous-rooted perennial, it is extensively cultivated in India and Central Asia. It has a pungent flavour and an overpowering odour. It is used in flavouring soups and in general cookery.

Capsicum frutescens, Linn.

SOLANACEAE

Eng. Chilli. Tam. Milakaai

All the species of capsicum were originally native in South America and the West Indies. Now the plants are spread widely over the whole world, except in the colder regions. The earliest mention of this spice is found in a letter written by Chanea, physician to the fleet of Columbus in 1494.

It is a small annual or biennial herbaceous shrubby plant cultivated for the sake of their pungent fruits. The chief use of capsicum is as a spice on account of their pungency and pleasant flavour. The fruit is also used fresh or dry, cut up finely in curries. Chilly powder is much used for flavouring pickles and used to flavour in general all food preparations.

Caryophyllus aromaticus, Linn.

MYRTACEAE

Eng. Clove. Tam. Kiraambu

It is a small conical tree, 25 to 30 ft. in height, native of the Moluccas and introduced in most tropical countries. The tree requires a deep rich sandy soil, and thrives in sloping land up to 2,500 feet. The cloves are the dried unexpanded flower ends, which are picked green, usually during January. They are spread in the sun for a few days to dry up when they become dark brown. Used in the preparations of sweets and for culinary purposes. Cloves are used for chewing to sweeten the breath. They are used by betel nut chewers.

Cinnamomum zeylanicum, Breyn.

LAURACEAE

Eng. Cinnamon. Tam. Lavangappattai

Cinnamon seems to have been one of the earliest known spices. But it appears to be doubtful whether the spice mentioned in the earlier writings was cinnamon or cassia bark (*Cinnamonum cassia*). Cinnamon was undoubtedly imported into Arabia in very early days from China. Both cinnamon and cassia were valued in Biblical times, and are often mentioned in the Old and New Testaments.

A fairly large tree growing 40 to 60 feet in height and a native of the moist low country of South India and Ceylon. The bark is used as a spice and for flavouring confectionery and also in curry and in the preparation of flavoured nuts for the purpose of chewing.

Coriandrum sativum, Linn.

UMBELLIFERAE

Eng. Coriander. Tam. Kothamali

This is one of the oldest known spices being mentioned in early Egyptian papyri and in Sanskrit authors under the name of Kustumburu. Coriander, the fruits of *coriandrum sativum* is a herbaceous annual. It is apparently indigenous to the Mediterranean region, cultivated in India, in Europe and in North Africa. Coriander, as a spice, forms an important ingredient in curry powder. It is also used in confectionery and in flavouring and other spirits.

Cuminium cyminum, Linn.

UMBELLIFERAE

Eng. Cumin, Tam. Seeragam

This appears to have been cultivated in Palestine from very early times, and is mentioned in the Old and New Testaments. It is an annual herb about one to two feet tall with much-branched plant. It is extensively cultivated in Malta, Persia, Turkey, Morocco and North India. It is used in the preparation of soups and for flavouring curry.

Curcuma longa, Linn.

ZINGIBERACEAE

Eng. Turmeric. Tam. Manjal

Dioscorides in 77 A. D. mentions a kind of "Cyperus" which resembles ginger, but when chewed, leaves a yellow colour and bitter taste, doubtless turmeric. Marcopolo mentions it as occurring at Koncha (i.e. neighbourhood of Fokien in China) in 1280 A.D., describing it thus, "There is also a vegetable which has all the properties of true saffron, as well as the smell and the colour, and yet it is not really saffron, It is held in great esteem and being an ingredient in all their dishes, it bears on that account a high price." This could only refer to turmeric.

A perennial herb, about 2 to 3 feet high, cultivated throughout tropical Asia. The tubers are powdered and used as an important ingredient in soups, curries etc. It is also used for colouring various sweetmeats on account of its bright yellow colour and pleasant flavour.

Elettaria cardamomum, Maton.

ZINGIBERACEAE

Tam. Cardamon. Tam. Aelekkai

This spice was known to Indian and Arabic writers in very early times. The Indian writer, Sastuta (about the eighth, century A.D.) mentions it under the Sanskrit name *Eta*. It is mentioned in the list of spices liable to duty at Alexandria in 176-180 A.D. A perennial, with large leafy shoots, upto 12 feet long. It has a strong creeping root stock (rhizomes) and is a native of the moist forests of Southern India and Ceylon upto about 4000 feet. It thrives best at 2000 to 4000 feet under natural shade preferring a moist, sloping place. The spice consists of fruit capsules which contain numerous small brown seeds. The capsules are gathered before they get fully ripe. The seeds are aromatic and used as an ingredient in compound preparations.

Myristica fragrans, Houtt.

MYRISTICACEAE

Eng. Nutmeg. Tam. Jadhikai

Nutmeg: A medium-sized large tree, usually 40-50 feet in

height, a native of the Molluccas. It is now cultivated in India, Ceylon and in South East Asia. It thrives best in deep, loamy and well-drained soil and in a hot and moist climate upto 2500 feet. It is used along with betels and nuts in chewing and as a spice in many food preparations.

Mace: This consists of the net-like wrapper (aril) surrounding the nutmeg inside the husk. Mace is a much-esteemed spice, being used in confectionery and for culinary purposes.

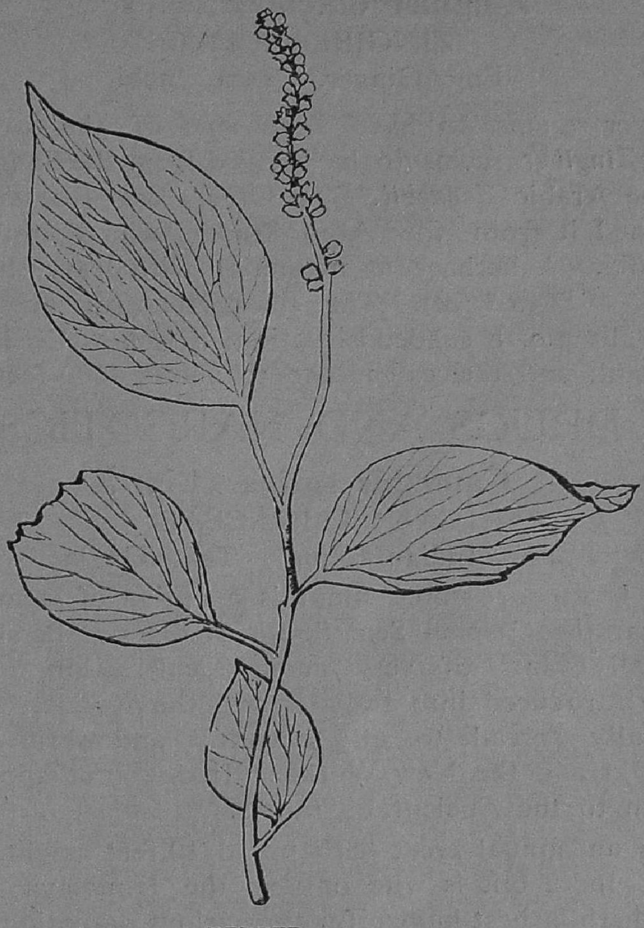
Piper nigrum, Linn.

PIPERACEAE

Eng. Pepper. Tam. Milagu

Pepper is one of the earliest known spices in the world and was formerly the staple commodity of trade between India and Europe. It is mentioned in the fourth century B. C. by Theophrastus who refers to two kinds of the spice, apparently black pepper and long pepper. White pepper was mentioned first by Dioscorides. and it was supposed in the early days that white pepper was grown as a different plant.

It is a perennial vine, indigenous to the moist low-country forests of South India, Ceylon and Malaya. The pepper vine requires moist heat with shade, and thrives up to 2500 feet above sea level. Both 'black' and 'white' peppers are obtained from the same plant. When the berries are red in colour, they are picked up and spread in the sun. These, when ground with the outer covering left on, form 'black pepper.' When it is deprived of the black covering, by first soaking in water for 7 or 8 days and rubbing with feet or otherwise, 'white pepper' is obtained. The important commercial varieties of pepper in Kerala are *Kulluvally, Balankotta, Karimunda, Kaniya Kadan,* etc. and in Mysore, *Malligasera, Keremalligasera, Arisina Moratta* and *Doddiga.* One of the most interesting features of the pepper vine is that it can be entirely female or male or bisexual. However, a large majority of the cultivated varieties are bisexual and are therefore high yielding.



PEPPER

Tamarindus indica, Linn.

LEGUMINOSAE

Eng. Tamarind. Tam. Puli

A very common evergreen tree distributed all over the Southern parts of India. The fruit is an ingredient of curries, soups and chutnies. Tamarind is very largely used by all people in the daily preparatiou of foodstuffs.

Zingiber officinale, Rose.

ZINGIBERACEAE

Eng. Ginger. Tam. Inchi

Ginger seems to have been one of the earliest spices. The name *Zingiber* seems to be derived from the Sanskrit *Sanjabil* through the Arabic *Zanzabil*. The Greeks and Romans appear to have obtained it from the Arab traders who doubtless brought it from India. A herbaceous perennial with leafy shoots; grows to a height of 2 to 3 feet. The plant requires an equable hot and moist climate, a shaded situation, a rich well-tilled humous or loamy soil, and thrives in land to about 4000 feet.

DRUGS AND NARCOTICS

Cannabis sativa, Linn.

CANNABINACEAE

Eng. Indian Hemp. Tam. Ganja

The hemp or ganja plant is a native of temperate parts of Asia near the Caspian Sea, Southern Siberia, Persia and India. It was at all events of very ancient cultivation. It is said to have been introduced into Italy during the Roman period, and has gradually spread to all temperate and warm countries of both the Old and the New Worlds. It does not appear to have been known to the Ancient Egyptians.

It is an annual erect herb up to 10 feet height. It is grown throughout India but is wild only in the Himalayas upto 10,000 feet. This herb is best known for the various narcotic preparations. The important constituents are a resin and a volatile oil; the resin is a potent intoxicant and a narcotic which produces a peculiar kind of intoxication attended with exhilarations of the spirits and hallucinations, said to be generally of a pleasing kind. It does not produce constipation nor loss of appetite. It is utilised in three different forms in our country: Ganja, Charas and Bhang.

Ganja: It is extracted from the dried flowering tops of the female plant covered with a resinous exudation. It is chiefly used as a smoke like tobacco, alone or in conjuction with tobacco.

Charas: It is the resinous exudation covering all the ariel parts of the plant; the exudation contains a large quantity of a tonic red oil.

Bhang: It is the beverage prepared from an infusion of the dried leaves and flowering shoots with milk and other ingredients. Of these three preparations, bhang contains the least quantity of narotic drug whereas charas is practically the drug itself and so more intoxicating and narcotic than the others. The plant possesses antispasmodic and anodyne powers for which it has been chiefly employed in medicine. It has been administered in he different forms of neuralgia, in spasmodic coughs and asthma, also in tetanus, hydrophobia and other anomalous spasmodic and painful diseases.

Cinchona officinalis, Linn.

RUBIACEAE

Eng. Quinine. Tam. Koina

Cinchona is one of the plant products that has made history. Botanists and plant collectors have undergone great hardships to bring the plant into cultivation to meet with our present demands. The medical value of the plant first became known in 1638 when Countess Chinchon, wife of the Viceroy of Peru, was cured by the use of cinchona bark powder. Cinchona bark is obtained from several species of Cinchona, a genus of trees belonging to the family *Rubiaceae* found truly wild only in South America but now extensively cultivated in Java, India, Ceylon and West Indies. In 1860 Cinchona plantations were started in India, Java and Ceylon.

The tree grows to a height of 35 feet at an elevation of 6000 to 7500 feet. The active principles of the bark of several species of cinchona are quinine and the alkaloids cinchonine, cinchonidine and quinidine. The methods of collecting the bark at the present time is known as "uprooting." It is done as soon as the tree reaches the period of growth; the trees are grubbed up and the bark is stripped from the trunk branches and roots. Another method practised in India is removing the bark in

alternate longitudinal strips and covering the wounds with damp moss in order to allow a new bark to develop on the exposed surface. Analysis shows that the secondary bark is richer in quinine than the natural bark. A third method known as shaving involves removing only the outer part of the bark by shaving with a tool.

Cinchona is used in all diseases of an exhausting nature such as malaria, small pox, gangrene, carbuncle, dysentary, typhoid and pneumonia.

As tonics, the barks in small doses are extensively employed in cases of debility with weak heart. Powdered bark is sometimes sprinkled over the surface of unhealthy ulcers; in such a case, it acts as astringent and antiseptic.

Nicotiana tabacum, Linn.

SOLANACEAE

Eng Tobacco. Tam. Pugayilai

The discovery of tobacco was made by Columbus through an accident in the course of a voyage from Persia to Spain in 1492. He and his men on landing in the little island of Tobagon were surprised to find the natives sniffing a powdered dry leaf with pleasure, and holding between their lips roughly-made rolls of dried-up leaves lit at one end, and blowing out the smoke immediately after inhalation through the mouth. Columbus and his men tried these leaves and were pleased with intoxications. They took with them to Spain some quantity of the leaves and seeds, and that is how tobacco was introduced in Europe. According to another account, tobacco was used by the Red Indians both for medicinal and ceremonial purposes. They used to inhale the smoke of the burning leaves through the nose by means of hollow-forked cane, and the name of the instrument was given to the plant which came to be known as Tabacco in Spanish and Tobacco in English. Tobacco is said to have been introduced in India by the Portugese in the beginning of the 17th century A. D. There are about 50 valid species of tobacco, but only two i. e., *Nicotiana tabacum* and *N. rustica* are cultivated. India grows both the species. *Nicotiana tabacum* belongs to the family *Solanaceae*.

It is an annual plant growing to a height of a meter. The soils most suited for tobacco cultivation are light to medium loams. As regards climatic conditions, a mean temperature of 70° to 90° F and an annual rainfall of 20" to 50" are ideal for tobacco cultivation.

Curing may be described as a process by which the harvested tobacco leaf is made ready for the market. Curing is essentially a drying process whereby most of the moisture in the leaf is removed. However, this process of drying is conducted in such a way as to produce certain well-defined and desirable qualities in different types of tobacco. There are four methods of curing namely (1) flue curing (2) air curing (3) fire curing and (4) sun curing. Thc flue-curing process consists of three distinct stages, (1) yellowing (2) giving the colour and (3) drying of the leaf. During yellowing, the leaf is kept at a low temperature of 90° to 95° F and high humidity till it attains a bright lemon yellow colour. It takes about 24 to 40 hours After yellowing, the temperature is raised gradually and the humidity lowered to secure fixation of the yellow colour. At the end of the second stage, the temperature is raised to 160° F to dry the midrib.

Flue curing is the quickest method of curing, taking about 5 to 6 days to complete. Flue-cured tobacco is generally used for the manufacture of cigarettes.

The alkaloid nicotine is a most energetic poison. As a medicine, tobacco leaf owes its value to its powerfully sedative and anti-spasmodic properties. In overdoses, it acts as as acro-narcotic poison, and it especially affects the action of the heart. It is given as medicine in tetanus, dropsical affection, spasmodic asthma, spasmodic colic and as a means of inducing muscular relaxation. The enormous consumption of tobacco is of course not as medicine but in the various modes of smoking, snuffing and chewing which are in common use in nearly every part of the world.

TOBACCO

Papaver somniferum, Linn.

PAPAVERACEAE

Eng. Opium. Tam. Kasakasa

The cultivation of the poppy plant dates from early time for Dioscorides (2nd century A. D.) mentions the collection of it in Asia Minor. As a medicine, it was used by the Roman physicians of the second century A.D.

The opium poppy is an annual herb that grows to a height of two to four feet. It is grown in Europe. At present, it is found throughout Europe, Asia, North Western Africa and North America. The yield of opium is great only when the plant is grown in the temperate regions. At present the great opium-producing countries are India, China, Persia and Turkey.

Opium is well-known and a valuable narcotic drug is obtained from the milky juice of unripe fruit capsules of the opium poppy. The drug is obtained by making slight incisions or scratches in the green unripe fruit, from which the milky-white juice exudes; by the morning, the milky juice will have coagulated in the fruit, and is then collected and made into balls, which form the ordinary opium of commerce. From this, Morphia, the active principle is obtained.

Pereira says, "Opium is, undoubtedly, the most important and valuable remedy of the whole of *materia medica*. But its enormous consumption by the habitual opium-eaters, causes more misery to human race than any other drug." In overdoses, it is a powerful poison, causing intense sleepiness which passes into a condition of stupor or coma, with gradually increasing slowness of respiration, feebleness of pulse and contracted pupils followed by death. Its effects are principally extended on the brain and nervous system and through the latter it affects, more or less, every organ of the body.

Opium is used in painful inflammatory affections as in peritoniti, acute pleurisy, and pneumonia. It is also of great use in haemorrhages and mucous diseases, for diminishing the amount of urine and in genito-urinary diseases. In rheumatic and neurotic affections, in strangulated hernia, colic of rectum and in numerous other affections, the use of opium is also frequently attended with the best of results.

DRUGS

The term 'drugs' includes all materials of animal, vegetable and inorganic origin which have been employed by man to alleviate his physical suffering. Here however only some of the

more important vegetable products so employed by man are described.

Abrus precatorius, Linn.

LEGUMINOSAE

Tam. Crab's Eye   Tam. Gundumani

Found throughout India, a perennial twiner. The root is described as emetic and useful in poisoning. Internally the seeds are described as poisonous and useful in affections of the nervous system, and externally, in skin diseases, ulcers, affections of the heart.

The seeds reduced to a paste are recomended to be aplied locally in stiffness of the shoulder joint, paralysis and other nervous diseases. In leucoderma, a paste composed of the seeds and plumbago root is applied as a stimulant dressing. In alopecia, a paste of the seed is recommended to be rubbed on the bare scalp.

The seeds are used as a purgative. but in large doses are an acrid poison. When boiled with milk, the seeds are said to make a very powerful tonic for the nervous system. Taken internally by woman, the seed disturbs the uterine functions and prevents conception. For the latter purposes, 4 to 6 seeds are swallowed every day in 2 doses for several days after each menstruation. The powdered seeds are taken as snuff in cases of violent headache arising from cold. The leaves are steeped in warm mustard oil and applied over the seat of pain in rheumatism. The juice of the fresh leaves, mixed with some bland oil and applied externally, seems to relieve local pain.

Aegle marmelos, Corr.

RUTACEAE

Eng. Bael Tam. Vilvam

Bael tree grows throughout India in dry hilly places. It grows to a height of 30 to 40 feet. It is extensively cultivated and frequently planted near Hindu temples.

Bael fruit is said to possess astringent properties, It is

regarded in India as a valuable remedy in diarrhoea, dysentry, habitual constipation and irregularity of bowels and in piles. The bark is used in the case of palpitation of the heart, and the leaves, in asthma.

Andrographis paniculata, Nees.

ACANTHACEAE

Eng. Great Chirata Tam. Nelavembu

An annual, a very common plant in all parts of India, growing in dry shady places. It tastes bitter and has tonic and stomachic properties. It has been employed with benefit in cases of general debility in convalescence after fevers and in the advanced stages of dysentry. It is also used in the treatment of colic and several forms of dyspepsia.

Bambusa arundinaceae, Retz.

GRAMINEAE

Eng. Bamboo Tam. Moongil

Found throughout the plains and low hills of India; wild and cultivated.

The tender leaves of this plant are used along with black pepper and common salt to check diarrhoea in cattle. The most efficient application for dislodgement of worms in ulcers is a poultice made by pounding the young shoots of the bamboo. The leaf bud is used as a decoction to encourage the free discharges of the menses when it is scanty. The bark cures eruptions The sileceous section formed on the joints of the stem in the female plants is a very useful medicine for paralytic complaints and poisonings.

Caesalpinia bonducella, Flem.

LEGUMINOSAE.

Eng. Physic Nut Tam. Kalarchikkai

It is a woody climber met with throughout India. The seeds are used in India as tonic. They have been employed with success in intermittent fever. The powdered kernels are mixed with castor oil and used as an external application in incipient

hydrocele. Tender leaves applied for toothache; also given for worms in children. The fatty oil obtained from the seeds are used for paralysis. The root bark is more valuable than the seed and is used in the treatment of intermittent fever and as a tonic.

Cardiospermum halicacabum, Linn.

SAPINDACEAE

Eng. Balloon Vine Tam. Mudakattan.

Found throughout India, chiefly in Bengal and the North Western States. A sub-scandent annual. Sanskrit texts describe the root as emetic, laxative and stomachic. Combined with other medicines, it is prescribed in rheumatism, nervous diseases, piles, etc. The leaves are administered in plumonic complaints. The leaves, mixed with castor oil, are employed internally in rheumatism and lumbago. The whole plant rubbed up with milk is applied in rheumatism and stiffness of the limbs. The leaves mixed with jaggery and boiled in oil is a good specific for sore eyes. The whole plant, steeped in milk is successfully applied to reduce swellings and hardened tumours. It is also a demulcent in gonorrhea and pulmonary affections.

Cassia angustifolia, Vahl.

LEGUMINOSAE

Eng. Tinnevelli Senn Tam. Senna

A small shrub grown extensively in India and Arabia. Senna is extensively employed as a brisk and safe purgative. Senna is well suited for children, elderly persons and delicate females.

Cyperus rotundus, Linn.

CYPERACEAE

Eng. Nut Grass Tam. Koraikizhangu

A common plant. Tall, glabrous, slender plant. The root is considered stomachic, and is used for washing the hairs. Also regarded as diaphoroetic and dieuritic. The root is given in conjunction with valerian in cases of epilepsy. The root is astringent, and useful in diarrhoea. A decotion is used in gonorrhea and also in syphilitic affections.

Eclipta alba, Hassk.

COMPOSITAE

Tam. Karisalankanni

Found throughout India. An annual erect slender weed. It is principally used as a tonic and in hepatic and spleen enlargements, and in various chronic skin diseases. There is a popular opinion that the herb taken internally and applied externally will turn the hair black. The fresh juice of the leaves rubbed on the shaven scalp for the purpose of promoting the growth of hair.

The juice, in combination with aromatic, is a tonic and two drops of it with eight drops of honey are administered to new born babies suffering from catarrh. It is externally used for ulcers, and an antiseptic for wounds in cattle. The expressed juice is used as the best form of administraion in hepatic derangements. The fresh plant is applied with sesamum oil in elephantiasis, and the expressed juice in affections of the liver and dropsy. It is anodyne and absorbent and relieves headache when applied with a little oil. The juice of the leaves is given in one teaspoonful doses in jaundice and fevers. The root is applied in conjunctivitis and galled necks of cattle.

Gmelina asiatica, Linn.

VERBENACEAE

Eng. Rais-madre dedeos Tam. Nilak-kumil

A large straggling shrub found in Bengal and Northern states. Used for rheumatism, pains in the loins and syphilitic diseases. The root is in great request in Goa as an antidote to every poison. The leaves and young shoots of this shrub abound with a thick viscid mucilage which is imparted readily to cold water, which when impregnated is employed in the treatment of gonorrhea to allay urine odour. At the present time the root is principally employed as a demulcent for gonorrhea and catarrh of the bladder.

Lawsonia inermis, Linn.

LYTHRACEAE

Eng. Henna Tam. Maruthani

Very common throughout India. A glabrous, erect shrub.

The leaves, combined with oil are used as an external application in headache. They are applied to the soles of the feet in small pox and are supposed to prevent the eyes being affected by the diseases. They also have the reputation of promoting the healthy growth of the hair and nails. The bark is given in jaundice and enlargement of the spleen, and as an alternative in leprosy and obstinate skin diseases. In decoction it is applied to burns. An infusion of the flowers is said to cure headache, and to be a good application to bruises. The fresh leaves are rubbed over the soles of the feet in diseases known as burning of feet.

Mallotus philippinensis, Muell.

EUPHORBIACEAE

Eng. Kamala Tree Vam. Kapila

This tree is widely distributed throughout India. Kamala acts speedly and actively as a purgative. It is used for expulsion of tape-worms. It has been used externally in ring-worm.

Michelia champaca, Linn.

MAGNOLIACEAE

Eng. Champaca Tam. Shembagam

According to Sanskrit texts, the flowers of this plant are bitter and are useful in treating leprosy, boils and itch. The flowers and fruits are considered bitter, and are used in dyspepsia, nausea, and fever. The leaves, anointed with ghee, and sprinkled over with the powder of cumin seeds, are put around the head in cases of puerperal mania, delirium and maniacal excitement. The flowers mixed with sesamum oil form an external application which is often prescribed in vertigo, The flowers are useful as dieuritic in renal diseases and in gonorrhea. The perfumed oil prepared from the flowers is a useful application in cephalalgia, ophthalmia and gout, and the oil of the seeds is rubbed over the abdomen to relieve flatulence. The juice of the leaves is given with honey in cases of colic. The seeds and fruits are said to be useful for healing cracks in the feet and the root is described as purgative.

Nelumbium speciosum, Wild.

NYMPHAEACEAE

Eng. Lotus Tam. Thamarai

Found throughout India. An erect, large herb of still waters, extensively creeping.

In bleeding piles, the filaments of lotus are given along with honey and fresh butter. The large leaves are used as cool bed sheets in high fever with much heat and burning of the skin. The seeds are used to check vomitting and given to children as dieuritic. The seeds form a cooling medicine for cutaneous diseases and leprosy and are considered as an antidote for poisons. The flowers are used as an astringent in diarrhoea, cholera, fever and diseases of the liver and are also recommended as a cardiac tonic. A *sherbet* of this plant is used as refrigerant in small pox, and is said to stop eruption and is used also in all eruptive fevers. The root is used as paste in ring worm and other cutaneous affections. The milky viscid juice of the leaf and flower stalk is used in diarrhoea. The powdered root is prescribed for piles as a demulcent, also for dysentery and dyspepsia.

Ocimum sanctum, Linn.

LABIATAE

Eng. Sacred Basil Tam. Thulasi

Found throughout tropical and hotter parts of India. A strongly-scented perennial. Herbaceous erect plant, one to two feet high; softly, patently hairy. The leaves have expectorant properties, and their juice is used in catarrh and bronchitis. This preparation also is applied to the skin in ring worm. An infusion of the leaves is used as a stomachic in gastric disorders of children, and in hepatic affections. The root is given in the form of decoction as diaphoretic in malarial fevers. The seeds are mucilaginous and domulcent, and are given in disorders of the genito-urinary systems. The juice of the leaves dropped into the ear is said to be a good remedy for earache.

Piper cubeba, Linn.

PIPERACEAE

Eng. Cubeb Tam. Vaalmilaku

This pepper is found wild in Java, and Sumatra. It is cultivated in other parts of the world also. Cubeb has stimulant and dieuritic properties. Their stimulant effects are especially manifested on the genito-urniary mucous membrane they are much employed in gonorrhea and gleet. In gonorrhea they should not be administered until the active inflammatory symptoms have subsided.

Quercus infectoria, Oliver.

FAGACEAE

Eng. Gall Tam. Maasikai

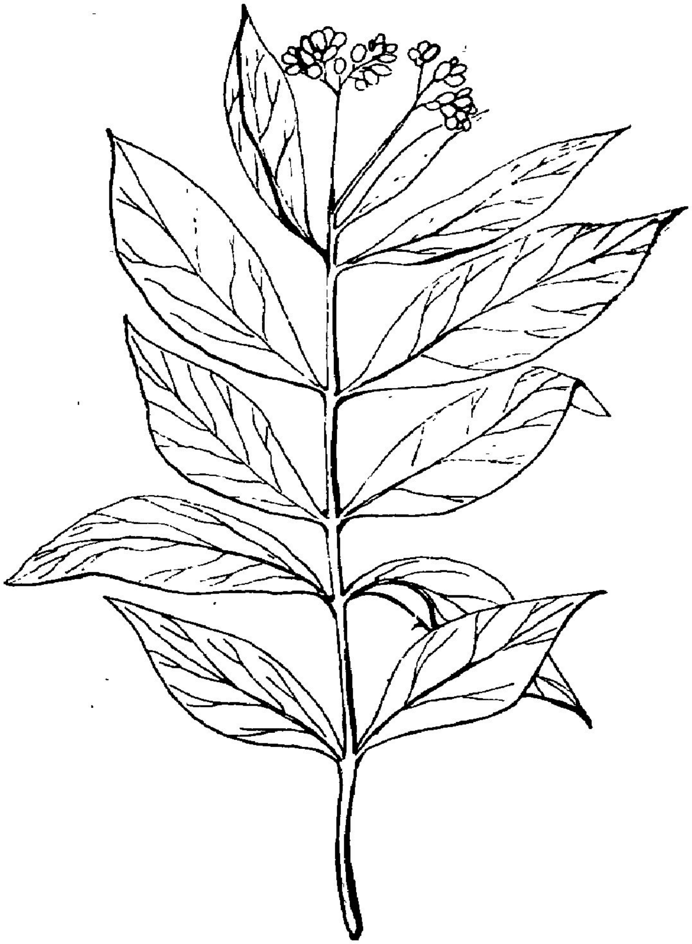
It is a kind of oak growing in many parts of Asia. It grows in India. It is a powerful vegetable astringent. In the form of decoction or when powdered, galls have been recommended as an antidote in poisoning. The tincture when diluted with water forms a very useful and convenient astringent gargle to wash. The diluted tincture may be also employed to lessen discharges from mucus membrane, as in gleet.

Rauwolfia serpentiana, Benth.

APOCYNACEAE

Eng. Common Snake Dog Bane Tam. Chivanamelpodi

Found in the tropical Himalayan range and plains near the foot of the hills and Western Ghats. A small erect glabrous shrub. It is held in high esteem as an andidote to snake bites. It is also valued as a tonic and febrifuge. The juice of the leaves is instilled into the eyes, as a remedy for the removal of opacities of the cornea. The root with *aristolochia indica* is given in cholera. But at present the active principle from the root is much used in blood-pressure; the decoction of the root is employed in labour to increase uterine contraction.



COMMON SNAKE DOG BANE

Santalum album, Linn.

SANTALACEAE

Eng. Sandal Wood Tam. Santhanam

The true sandalwood is indigenous in Mysore and Madurai in India. Sandalwood has a reputation of being a remedy in fevers, indigestion, palpitation and many other affections. The powdered wood, made into a paste with water, is a common

application in inflammatory affections and in skin diseases. The volatile oil has also been recommended as a remedy in gonorrhea.

Semecarpus anacardium, Linn.

ANACARDIACEAE

Eng. Marking Nut Tree Tam. Sherankottai

A tropical tree throughout the hotter parts of India. In Hindu medicine, the ripe fruits are regarded as acrid, heat stimulant, digestive, nervine and are used in dyspepsia, piles, skin diseases and nervous debility. Mohamedan writers consider the juice of the pericarp to be hot and dry, useful in all kinds of skin diseases and epilepsy. It is also administered for weakness of memory. It is used as a specific in all kinds of veneral diseases. A brown gum which exudes from the bark, is a valuable medicine in veneral and leprous affections. An oil from the nut acts as a vesicant in rheumatism and sprains.

The oil is also of great service in asthma, secondary syphilis, neuralgia and paralysis. The fruits are fried in mustard oil and used for curing leucoderma. The leucordermic spots show spots of fresh deposition of pigments, and after a prolonged use, distinct change of colour is generally got. The oil is irritant to the whole of the digestive tract in big doses. In medical dose, it increases appetite and powerfully increases the secretions. It is a good cardiac tonic. Under its influence many cardiac troubles are noticed to subside in a short time. The rate of the heart beat is usually increased. The drug is generally respiratory stimulant. It was tried with success in several cases of pneumonia. It was used in cases of epidemic dropsy of the legs successfully.

Sesbania aegyptiaca, Pers.

LEGUMINOSAE

Eng. Common Sesban Tam. Chithagathi

A weedy tree-like herb found throughout India. The seeds are used to reduce enlargement of the spleen. The seeds are applied in the form of ointment to eruptions for which the juice of the bark is also given internally. The leaves are applied in

the form of a poultice to hydrocele and rheumatic swellings and also to promote absoption of boils and abcesses. The root well crushed and made into a paste, is an excellent application for scorpion stings.

Strychnos nux-vomica, Linn.

LOGANIACEAE

Eng. Nux-vomica Tam. Yetti

This tree is common in many parts of Southern India. It is cultivated for its seeds. Nux-vomica possesses valuable nervine tonic and stimulant properties. They have been found of special value in the treatment of paralysis, lead poisoning, also in neuralgia, impotance, incontinence of urine, epilepsy and other affections. Nux-vomica bark is used as local application to leprous, syphilitic and other obstinate eruptions. A decoction of the leaves is also used as an external application in rheumatism.

Tephrosia purpurea, Pers.

LEGUMINOSAE.

Eng. Wild Indigo Tam. Kaavali

Found throughout India. A copiously-branched sub-erect herbacious perennial. The plant is deobstruent and dieuretic, useful in cough and tightness of the chest, obstructions of the liver, spleen and kidneys. It is recommended as a good purifier of the blood and for boils and pimples. It is used in combination with *cannabis sativa*, leaves as a remedy for bleeding piles and with black pepper, as a dieuretic, especially useful in gonorrhea.

Terminalia chebula, Retz.

COMBRETACEAE

Eng. Black myrobalan Tam. Kadukkay

A large deciduous tree, found all over India particularly from Kumaon to Bengal. It is a laxative, stomachic tonic and alternative. The seeds are used in fevers. cough, asthma, urinary disease, piles, intestinal worms, chronic diarrhoea, flatulences vomitting, hiccup, heart-diseases, enlarged spleen and liver. As an alternative tonic for promoting strength, preventing the effect,

of age and prolonged life. The fruits are used as a medicine for sore-throat. A fruit finely powdered is used as a dentifrice, said to be useful for bleeding and ulceration of gums. A fruit, coarsely powdered and smoked in a pipe, affords relief in a fit of asthma. Water in which the fruits are kept for the night is considered a very cooling wash for the eyes. The ashes mixed with butter form a good ointment for sores.

Toddalia asiatica, Lam.

RUTACEAE

Eng. Forest Pepper Tam. Milagarani

A common plant in Southern India. Toddalia root was formerly esteemed in European practice as a remedy for diarrhoea. It is regarded in India as a valuable stimulating tonic. It is the best remedy for the remittent jungle fever, commonly known as hill-fever. Dr. Bidie says that he knows "no single remedy in which active stimulant, carminative and tonic properties are so happily combined as in this drug". Warming says, "that in constitutional debility, and in convalescence after febrile and exhausting diseases it is apparently a remedy of great value." In India it is usually administered in the forms of tincture and infusion.

Veronia anthelmintica, Willd.

COMPOSITAE

Eng. Purple Flea Bane, Tam. Kattu Seeragam,

Found throughout India. A tall robust leafy annual. In Indian medicine, the seeds are of great repute as a remedy for leucoderma and other diseases. It is given internally to remove worms from the intestine, and a poultice or plaster of it is used to disperse cold tumours. The seeds are considered to be as powerfully anthelmintic and are also an ingredient of a compound powder prescribed in snake bites. The infusion of the seeds is given for coughs and against flatulence. The juice of the leaves is given to cure phlegmatic discharges from the nostrils.

DYES

Many vegetable dyes have been now superceded by artificial dyes, such as aniline, alizarine and other products of coal tar. But certain vegetable dyes are still of some commercial importance. Vegetable dyestuffs are extracted by processes of fermentation, boiling and treatment with chemicals. Various shades may be obtained from a single dye by the use of different mordants with which the fabrics to be dyed are treated.

Early Egyptian pictures show red, yellow and green cloth. By 1500 B. C. striped red, deep blue and yellow cloth became fashionable. As early as 2000 B.C., the dyeing of linen and leather was not only an individual craft but a temple industry. In Hellenistic times, dyeing became a state monopoly. According to Pliny, "the ancient Egyptians were expert dyers and acquainted with the use of mordants which, it would seem they derived from Hindustan". The early history of the development of dyeing cannot be exactly traced, as there seems to be no literature on the subject in existence. There are, however, certain facts of history and tradition which tend to show that the process of dyeing was not unknown to early Indians in the earlier part of the Brahmanical age. For example, Rama, who ruled at Ayodhya, is known to have been fond of using yellow-coloured garments. Blue and yellow are said to have been favourite colours with Krishna and red with Hanuman. In the Institutes of Manu, certain precepts regarding the use of colours and sale of dye stuffs and dyed fabrics by the Brahmans are mentioned. The ancient Indians succesfully practised the art and were able to produce coloured patterns upon woollen and cotton fabrics by processes analogous to those now in use. The art of dyeing as a whole seems to have been cultivated with greater energy by the Moghals.

Acacia catechu, Willd.

LEGUMINOSAE

Eng. Catechu. Tam. Kaasukkatti.

A spiny tree common in the dry forests of South India. The chief product of the tree is catechu which is an important

catecholan. It is obtained by cutting the wood into chips and then placing them in a sieve inside a boiler with water below. As the water boils the steam passes through the chips and extracts the Kath which is taken as sediment and dried. Catechu produces the various shades of brown colour.

Berberis aristata, D. C.

BERBERIDEAE

Eng. Barberry. Tam. Mullukkata.

A tree commonly found in South Indian hills. The stem and root yield an yellow dye. It is used for dyeing leather.

Berberis nepalensis, Spreng.

BERBERIDEAE

Eng. Holly Leaved Berberry, Tam. Mullukkadambu.

An evergreen shrub or tree of Nilgiris and other hill ranges at 5000 to 8000 ft. The root and the stem yield an yellow dye. Used in colouring leather. The colour exists chiefly in the bark. It is one of the best dyes in India.

Bixa orellana, Linn.

BIXACEAE

Eng. Arnatto. Tam. Aavam.

An evergreen American tree cultivated in various parts of South India. The red pulpy covering of the seed yields the Arnatto dye. The dye is of a bright yellow colour and imparts a deep orange colour to silk and cotton. It is also used to colour butter, cheese, confectionery, hair-oils, shoe polishes, floor polishes and pharmaceutical oinments. It is occasionally used for colouring feathers, wax, ivory, bones etc.

Crocus sativus, Linn.

IRIDACEAE

Eng. Saffron. Tam. Kungumappu

A perennial herb extensively cultivated in Kashmir. It is chiefly used in Europe as a dye and to colour cheese, pudding

etc. In India it is rarely used for dyeing cloth owing to its costliness. It yields an yellow dye.

Curcuma longa, Linn.

ZINGIBERACEAE

Eng. Turmeric. Tam. Manjal.

A small plant cultivated in all parts of South India. The rhizomes or underground stem contains a yellow dye. It requires no mordant to dye cotton fibre and gives a golden yellow colour to wool and an orange to scarlet colour to cotton. The action of an alkali changes its colour to red. In combination with safflower and indigo, it produces different shades of green and orange. It is also used for colouring food materials.

Erythrina indica, Linn.

LEGUMINOSAE

Eng. Indian Coral Tree. Tam. Kalyanamurungai.

A deciduous tree common in South India, often planted for ornament. The bark yields an yellow dye. The dried red flowers yield a red dye.

Indigofera tinctoria, Linn.

LEGUMINOSAE

Eng. Indigo. Tam. Neelam.

Indigo is grown in almost all districts except those in the Himalayan region. It is a small shrub. The plant is ready for cutting just before flowering. The leaves yield the natural indigo of commerce which forms one of the most important dyestuffs. As a vegetable blue dye, it is unrivalled because of its great natural fastness, both to light and water; it is used for dyeing and painting. The dye is prepared either from the green leaves or from the dry leaves.

Lowsonia inermis, Linn.

LYTHRACEAE

Eng. Henna. Tam. Maruthani

It is a small, elegant and sweetly-scented tree cultivated

commonly throughout India. The leaves contain an orange dye. Henna is rarely used as a dye, but is a favourite with ladies who paint their fingers, nails and feet by covering them with a paste prepared for this purpose by pounding the freshly-plucked leaves. The colour it imparts is bright orange. It is also used for dyeing hair. The decoction of the leaves is occasionally used for dyeing cloth.

Mallotus philippinesis, Muell.

EUPHORBIACEAE

Eng. Kamala Tree. Tam. Kapila

A small tree common all over South India. The dye is obtained from its fruit in the form of a red powder found inside the capsules. In the presence of alkaline carbonates, it produces deep red solutions. A very fine and durable fiery orange colour is imparted to silk by the solution obtained by dissolving the colouring matter with the aid of alkalies.

Nyctanthes arbor-tristis, Linn.

OLEACEAE

Eng. Coral Jasmine. Tam. Pavalamalli.

An evergreen tree of ten feet cultivated in gardens for its fragrant flowers. The orange-coloured corolla tubes yield an orange or golden dye which is not durable. The dye however is used for silk in combination with turmeric.

Oldenlandia umbellata, Linn.

RUBIACEAE

Eng. Chay Root. Tam. Chaya Vaer.

A small plant which occurs in sandy soils all over South India. The root yields a red dye; with alum as a mordant, it is used for dyeing red sarees and hand kerchiefs.

Pterocarpus santalinus, Linn.

LEGUMINOSAE.

Eng. Red Sandal Wood. Tam. Chegappu sandanam.

It is a small tree found in South India. The heart wood

contains a red colour. It is used as a pigment for marking idols and the forehead in ceremonies. It is used for dyeing cloth. It is equally used for dyeing leather and staining wood.

Punica granatum, Linn.

PUNICACEAE

Eng. Pomegranate. Tam. Maadulai,

It is a small tree cultivated throughout India in gardens for the sake of its fruits. The rind gives a greenish yellow colour. The rind is also used as mordant. The flowers produce a light red but fleeting colour.

Rubia cardifolia, Linn.

RUBIACEAE

Eng. Indian Madder. Tam. Mangitte

A herbaceous creeper, found throughout the hilly parts of South India. The plant yields a red dye and the root is much used for dyeing coarse cloth. The root and the lower twigs are the dye-yielding portions. It is also used in calico printing.

Toddalia asiatica, Pers.

RUBIACEAE

Tam. Milagarani.

A large climbing shrub common all over South India. The root bark contains an yellow dye which is extracted by the help of water.

Ventilago madraspatana, Gartn.

RHAMNACEAE

Eng. Buck Thorn. Tam. Vembadam.

A large climbing shrub of the drier forests of South India. The root bark contains a valuable dye. It yields a beautiful chocolate colour. The dye is largely used for cotton cloth.

Wrightia tinctoria, Br.

APOCYNACEAE

Eng. Dyer's Oleander. Tam. Veppaalai.

A tree common all over South India. The leaves yield a

kind of indigo. The seeds are said to be used as an adjunct to other materials in dyeing.

TANS

The operation of "tanning" consists of the conversion of hides and skins into leather. This change is effected by the use of certain vegetable products called tanning materials which contain a peculiar compound known as tannin, having the property of combining with the substance of hides and skins to form leather, thus converting a material which readily decays into one which is proverbially stable. Tannin occurs in all parts of plants, but appears to be most concentrated in those portions which are of relatively little use to the plants as living agents viz., the bark of the stem or root, the rind or husk of the fruit or the heartwood though in a few cases it occurs in large quantities in the living parts of the plants e.g. in the leaves and roots.

Some of the most important tanning materials are:

Acacia farnesiana, Willd.

LEGUMINOSAE

Eng. Cassie. Tam. Peivelam.

An American shrub cultivated in various parts of South India. The bark and pods are used as tanning material.

Albizzia procera, Benth.

LEGUMINOSAE

Eng. White Siris. Tam. Kondavagai.

A large deciduous tree common all over South India. The bark is used for tanning.

Avicennia officinalis, Linn.

VERBENACEAE

Eng. White Mangrove. Tam. Uppattam.

A shrub of the salt marshes and tidal forests of South India. The bark is used as a tanning material.

Bauhinia vahlii, Wrigh. Arn.

LEGUMINOSAE

Eng. Camel's Foot Climber. Tam. Segappu-manchori.

A medium-sized tree, flowering during the hot season. It is distributed throughout India in the dry forests. The bark is used for tanning.

Hymenodictyan excelsum, Wall.

RUBIACEAE

Eng. Bustard Cidar. Tam. Kadappu.

A large tree found throughout South India. The bark is used as a tanning material.

Psidium guajava, Linn.

MYRTACAE

Eng. Guava. Tam. Koyya.

A small evergreen tree cultivated throughout South India and other parts of India. The leaves are employed in tanning.

Terminalia chebula, Retz.

COMBRETACEAE

Eng. Black Myrobalan. Tam. Kadukkay.

A large tree common all over South India. The fruit is used for tanning.

CORK

Quercus suber, Linn.

FAGACEAE

Eng. Cork. Tam. Kaark.

The meaning of the word "Cork" as applied to-day is derived from the Arabic "Kalafa" meaning to stop the steam of ships. The cork-producing countries, practically covering the whole of Portugal and Spain, Tunis and Algeria, rank next in importance to Southern France including Corsica.

The cork oak attains a height of about 40 feet and at times reaches 150 feet and measures as much as 4 feet in diameter. It flourishes best in an altitude of 1000 feet to 3000 feet in an average mean temperature of 55° F. The corkwood or cork of commerce is the external part of the thick outer bark of the cork oak tree which may be removed from the same tree at intervals of 8 to 10 years after it attains an age of about 20 years. The stripping generally takes place during July and August and it is a process which demands skill and care. The thickness of the bark ranges from 1·27 centimeters to 6·86 centimeters. The first stripping of the cork is not as fine in quality as that of the third and subsequent strippings. At the age of about forty years the oak begins to yield its best cork. The harvested cork fresh from the plant is raw corkwood with bark. The raw corkwood is chemically treated, mechanically compressed, graded and cut first into slabs and then into the required shape for the market.

Cork is exceedingly light, compressible and a poor conductor of heat and sound. Cork finds extensive application in making stoppers, cork-boards, cigarette tips, different types of handles, buoys, life-belts, foot-wear, hats, sporting equipment, linoleum and linotiles, artificial limbs, in lining entomological cases, in air-conditioning and in sound-proofing apartments.

SEA WEEDS

Several marine algae of economic importance, including *Gelidium* and *Gracilaria*, occur on Indian coasts. Several species e. g. *Porohyra vulgaris*, *Gelidium cornium* etc., are used as food in Japan and China and these are cultivated in Japan. Similarly *Chondrus crispus*, *Laminaria saccharina* and *Rhodymenia palmata* are eaten in Ireland, Scotland and America. A few of the algae belonging to the genera *Gelidium*, *Gracilaria* and *Ulva* and occuring on the coasts of India are also edible. The food value of algae, however, is low. Their carbohydrates, chiefly glactans, mannans, pentosans etc. are not easily digested by gastric enzymes. Most of these species do not contain cellulose, and starch is found only in a few. Several of them are poor in proteins and fat,

but they contain vitamins. But from time immemorial, marine algae have formed a very important part of the food of the Japanese people. At present perhaps six or seven different kinds of sea weeds are used in a single meal. The national diet in Japan consists of rice, fish and sea weeds.

The marine algae are used as manure, particularly in areas where large quantities become available as drift weed. They supply mainly potash and a small amount of nitrogen, and the organic matter in them increases the humus content of the soil. The burning of sea weeds for the recovery of potash and iodine is an old industry in Scotland, Norway, France and Japan. 25 percent of world's annual production of iodine is contributed by sea weeds.

Agar-agar : The dried aqueous extract of some of the species of red algae is known as agar-agar or agar. It comes into the market in the form of translucent sheets, rectangular blocks, flakes, sheaves of ribbons and also as powder. Commercial agar varies in colour from yellow to pink or black. The best qualities are nearly colourless. Agar-agar has long been used as food, by the Chinese and the Japanese. It is eaten in the sauces etc. It is also used in Europe and in other countries in ice creams, jellies, and jams. In recent times it has found various industrial uses as a sizing material, emulsifying agent, in the dyeing and printing of textiles and in the finishing of leather. Agar-agar is a constitueut of several high grade adhesives. It is also used in medicine. Medical agar-agar should not yield more than 5 % percent of ash. It has little nutritive value and is mainly employed in laxatives. It is also used in dressing certain types of wounds because of its inhibitory action on blood clotting. Biscuits made from these are given to diabetic patients. The most important use of agar-agar is for the preparation of culture media in bacteriology. Its chief advantage is that, unlike gelatine, it is not liquified by any organism. It forms firm jelly without refrigeration.

Alginic acid : Alginic acid or algin is an interesting technical product obtained from certain *Laminarias* by extraction with sodium carbonate. It is principally used as a stabiliser in food

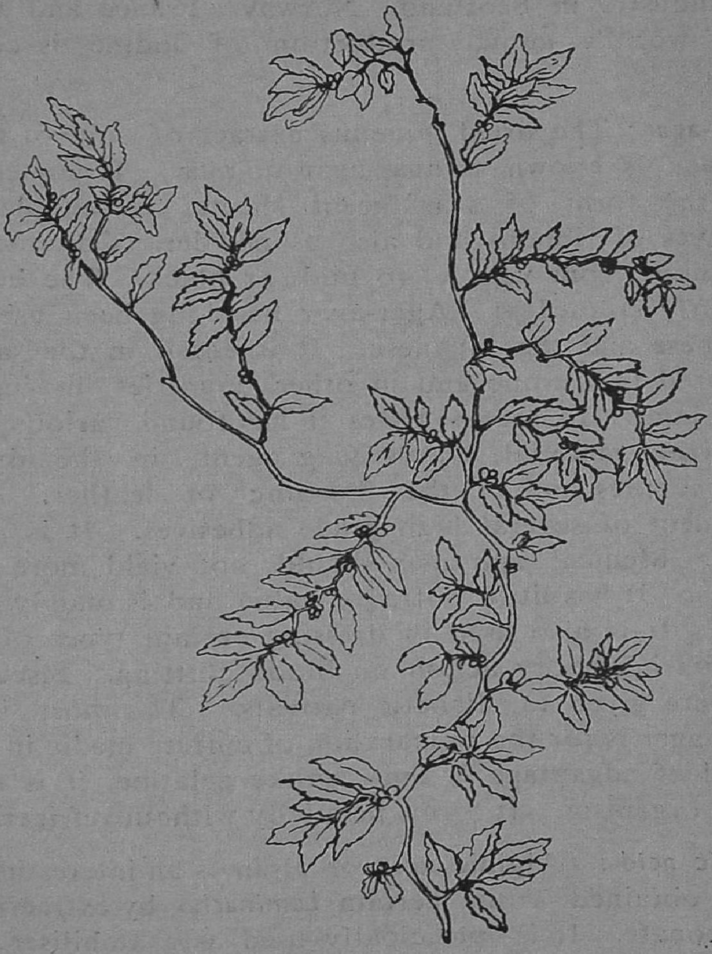
industries such as ice cream manufacture. The salt is generally used for many purposes for which gums and pectins are employed, e. g. stabilisers, sizing materials. Solutions of sodium alginate dissolve shellac. The lacquer, when it dries, gives a tough and tenacious film which is rendered insoluble by treatment with acids.

Prophyra tenera, Rhodymenia dissecta and *Ulva lactuca* are some of the edible algae that are exhibited. Agar-agar is prepared from the following sea weeds:

1. *Gelidium micropterum*, 2. *Gracilaria crassa*, 3. *Gracilaria lichenoides*

Iodine and Algin are prepared from the following sea weeds:

Sargassum muricatum, *Sargassum tenerrimum*, *Sargassum wightii*.



BROWN
ALGA

PAPER MANUFACTURE

Before the invention of paper, man's records were carved in stone, inscribed on dry tablets or written on papyrus. Papyrus was the precusor of paper, and it was manufactured in Egypt as early as 2400 B. C. It was made by stripping the coarse fibres from the papryus plant, laying them in crisscross fashion on a hard, smooth surface and pressing them to form a sheet. The surface was smoothed by rubbing with ivory or stone. Many papyrus manuscripts are still in existance.

The discovery of the art of papermaking is attributed to the Chinese. The exact date of this discovery is not known. But most historians record that it was about 105 A. D., since it was in that year that the invention was officially reported to the Emperor by Tasi Lun to whom the credit for it is usually given. The first papers seem to have been made to some extent from the inner bark of the paper mulberry tree and to a large extent from bamboo. The Chinese established a paper mill at Samarkand sometime during the sixth century A. D. The Arabs captured the city of Samarkand in 704 A. D. and learned the art of paper-making. In 795 A. D. the Arabs introduccd the art into their own country by bringing the Chinese workmen to Bagdad, and for nearly 500 years, the industry was maintained as a state monopoly, the secrets of this process being carefully guarded.

The essential constituent of paper is cellulose, and paper makers depend entirely upon vegetable fibres for their supply of this material. There are really very few fibres which cannot be made into paper of varying qualities, the amount of cellulose they contain and the cost of manufacture being the main considerations. In fact any fibrous material containing over 30 percent of cellulose and yielding ultimate fibres of length over 1 m.m. can be used for paper-making, At the present day probably the most important source of material is found in wood pulp.

preferably coniferous, reduced to a soft pulp by mechanical and chemical means.

Some of the common raw materials for this industry that are exhibited are hemp, aloe, jute rags, cotton rags, bamboo, and straw etc.

MATS

Along with basketery, mat-weaving is practised throughout India and among various communities. Mats of cane, grass, palm and date-leaf are made all over India. These mats are used as floor coverings in Indian homes, serving the same purpose as woollen carpets. Mats are also used as wall decorations, table covers, bedspreads and for various other purposes. Floor mats are commonly made in South India. Regarding them, Dr. G. Bidie has written, "The finest counts are made of the *cyperus monganlsa* and are left either un-coloured or decorated with two plain bands of red and black at each end. They may be made so fine that a mat sufficient for a man to lie on can be rolled up and packed into the interior of a moderate-sized walking stick". According to Pandit Natesa Sastri, " plain but very fine mats are made at Pattamadai in Tirunelveli district, the weft being of Korai grass and the warp of cotton or even silk thread of 80 to 100 counts. The surface of the mat is softer than silk. It can be folded like cloth and carried in a man's fist if rolled like a stick. However in the harmonious intermingling of Hindu colours and Hindu patterns of decorations, the Palghat mat alone stands uninvaded. The best quality mats are superb specimens weighing only 12 or 13 ounces, and are so pliable that they can be easily folded without suffering any damage".

Mats are produced on a large scale in all parts of Tamil Nadu. The leading centres of this industry are located in the districts of Tirunelveli, South Arcot, North Arcot and Salem. Mats are made out of screwpine, palm leaf, cocoanut leaves but mostly out of Korai grass which grows wild on river banks and on the sides of pools, streams and water channels. The grass is also cultivated in the regions of Tiruchirappalli, Thanjavur and

North Arcot. It is believed that only the wild variety gives the finest mats.

TIMBERS

Adina cordifolia, Hook. F.

RUBIACEAE

Eng. Yellow Teak, Tam. Manjakadambu.

A large deciduous tree, often buttressed, found in forests throughout the moister regions of India. The freshly-cut wood is yellowish but later it turns reddish-brown. It is moderately strong and takes good polish. It is used for dugout canoes, planking of river boats, packing cases, cigar boxes, sieve frames, furniture, yokes, toys, drums, agricultural implements etc. It is in great demand specially for making the best quality combs and bobbins and is one of the best of our timbers suitable for flooring and panelling of railway carriages.

Anogeissus latifolia, Wall.

COMBRETACEAE

Eng. Axle-wood Tree. Tam. Vellanagai.

A large deciduous tree and a native of forests of the Himalayas and Southern India. The wood is purplish brown, lustrous, tough, strong and polishes well. It is used for poles, rafters, cart building, yokes, agricultural implements, spinning wheels, helve timber, furniture etc. The wood has also been found suitable for making skis.

Boswellia serrata, Roxb.

BURSERACEAE.

Eng. Incense Tree. Tam. Vellai Kungiliam.

A moderate-sized deciduous tree. It is very common in the moist forests of India. The wood is yellowish-brown to dark greenish-brown, moderately hard, fairly durable. It is used for ammunition boxes, mica boxes, packing cases, cheap furniture, toys, masts of boats, hookahs, match-splinters and second-grade plywood.

Calophyllum tomentosum, T. And.

GUTTIFERAE

Eng. Sirpoon Tree. Tam. Pongu.

A large, magnificent, evergreen tree. Found in evergreen forests of the Western Ghats upto 5000 ft. The wood is lustrous, reddish-brown, elastic, moderately hard and fairly durable. It is used for masts of ships, telegraph poles, bridge construction, building purposes, crane shafts, railway carriages and cheap furniture.

Cedrus deodara, Loudon.

CONIFERAE

Eng. Himalayan Cedar. Tam. Dhevadhari

A very large and tall tree, found in the North-Western Himalayan region and South India. Heart-wood is light, yellowish-brown, scented, moderately hard. It is extremely durable. It is used as railway sleepers, bridges, furniture and shingles.

Dalbergia latifolia, Roxb.

LEGUMINOSAE

Eng. Rosewood Tam. Eetti

A deciduous tree, attaining to a large size in South India, also found in Bengal and Central India. Sapwood yellow, small; heartwood extremely hard, dark purple with black longitudinal streaks. It is a valuable furniture wood for cabinet work, railway sleepers, carving and ornamental works.

Dalbergia sissoo, Roxb.

LEGUMINOSAE

Eng. Sissoo Tam. Sissu.

A large, deciduous tree of the sub-Himalayan tract from the Indus to Assam ascending to 2000 ft. Sapwood small, white; heartwood brown with darker longitudinal veins, close and even-grained, seasons well; very hard. The wood is very durable. It is highly esteemed for all purposes where strength and elasticity are required, for fallows and naves of wheels, carved work of

every description, for framing work, for boat-building and furniture.

Dipterocarpus turbinatus Gaertn. F.

DIPTEROCARPACEAE

Tam. Varungu

A lofty, evergreen tree, exceeding 200 ft. in height. It is found in evergreen forests of Assam. The wood is light, reddish-brown. It is commonly used in boat-building, structural work, railway sleepers, planking, flooring, dugout canoes, tea chests and packing cases.

Fraxinus excelisor, Linn.

VERBENACEAE

Eng. Ash

It is found in England, Europe, North America and parts of Asia. The wood is white to whitish-brown, moderately hard, very strong and durable. The wood is used in carpentry and sports goods.

Lagerstroemia speciosa, Pers.

LYTHRACEAE

Eng. Pride of India Tam. Kadhali

A large, deciduous tree common in the forests of Assam, Bengal and the West Coast. The wood is light red to reddish-brown, shining, hard, very durable under water and takes a good polish. It is an excellent wood for ship-building, boats, canoes, gun carriages and carts. It is also used for railway sleepers, beams, bridges, furniture, water tanks and wood pipes.

Mangifera indica, Linn.

ANACARDICEAE

Eng. Mango Tree Tam. Maamaram

A large evergreen tree, indigenous in Sikkim and parts of Assam and cultivated throughout India. The wood is dull grey with darker patches or streaks, lasts well under water. It is very suitable for piles, completely immersed in water; it is used

for planking, doors and window frames, tea chests, packing cases furniture, ploughs, yoke, plywood and for building purposes.

Morus alba, Linn.

MORACEAE

Eng. White Mulberry Tam. Mulberry chedi

A small or moderate-sized deciduous tree found in sub-Himalayan tracts from Kashmir to Sikkim upto 11,000 ft. The wood is orange-brown and hard. It is used for house building, furniture, boats, agricultural implements, turnery and packing cases. The timber is in great demand for the manufacture of sporting requisites like cricket bats, hockey sticks, tennis and badminton rackets.

Picea morinda, Link.

CONIFERAE

Eng. Himalayan Spruce

A tall, evergreen, conical tree, found in the Himalayas from Bhutan to Kurum Valley at 8000 - 12000 ft. The wood is usually white, soft to moderately hard. It is used for internal woodwork, house-building, packing cases, water troughs and rough furniture. The wood is also useful in the match industry for making match boxes, match sticks and peelings.

Pinus excelsa, Wall.

CONIFERAE

Eng. Blue pine

A large evergreen tree found in the temperate Himalayas. The wood is pinkish-red to light red, moderately hard and highly resinous. It is the best of our pines; it is specially used for house-building, carpentry of all kinds, packing cases and camp furniture. It finds extensive use for match sticks and match boxes. The wood is also used for making bodies of violins.

Tectona grandis, Linn.

VERBENACEAE

Eng. Teak Tam. Thaekku

A large, deciduous tree found in Central and Southern India.

The wood is golden-yellow when freshly cut, aging to brown or almost black. Modertely hard, oily, scented, strong, extremely durable, takes a beautiful polish and does not corrode in contact with metal. It is one of our outstanding timbers. The timber has varied and numerous uses and so is highly prized; it possesses excellent qualities for ship-building, for hulls of wooden ships, fittings of battle ships, boat masts and spars. It is extensively used for house-building, bridge construction, piles, pit props in coal mines. high class joinery, furniture, cabinet works and railway carriages. It is also in great demand for numerous minor purposes such as combs, jars, bowls, toys, brush backs, bodies of pianos, organs and harmoniums, keys of violins, carvings and tuning shingles, helms etc. The hard knots which occasionally develop on the trunks are prized for making tobacco pipes.

Terminalia tomentosa, W & A.

COMBRATACEAE

Eng,. Blackmurdah Tam, Karummarudu

A large, deciduous tree. Widely distributed throughout India. The wood is dark brown, hard, fairly durable and very handsome when polished. It is very valuable timber and used extensively for building purposes, railway sleepers, ships, boats, carts, agricultural implements, toys, furniture, cabinets, oil mills, rice pounders, mining timber. cart wheels, engine brake blocks, electric casing, etc.

TOYS

From very early times, toys were used as objects of amusement for children. The excavations at Mohanjodaro and Harappa brought to light a few toys. Wood is one of the materials used for toys in many parts of India. In many centres of Andhra Pradesh, wooden toy industry has been carried on traditionaly and it has been the main occupation for a number of families. Kondapalli and Tirupati in Andhra Pradesh are two famous centres of toy-making. The themes for these toys are drawn from Hindu religion and mythology. Besides the religious themes, the

products of this old industry also include the models of animals, birds, human beings, houses etc. For making toys, the craftsmen of Tirupati makes use of red wood; the colour of the wood itself serves as colour for the toys. The toys that are on display are made from the wood of *Gyrocarpus jacquini*, Roxb., and *Pterocarpus santalinus*, Linn. F.

GREEN MANURE PLANTS

Organic manures have played a big role in agriculture down these several centuries. Among them green manure ranks foremost because it can be easily produced and utilized by the farmer when farm yard manure or compost is not available. These manures are either green manure crops or green leaf manure. Crops that are grown for the purpose of adding organic matter to the soil are known as green manure crops. Green-leaf manuring consists of gathering green leaves from one place and adding them to the soil in another place, In both cases of manuring the organic material should be worked into the soil while it is young and before it becomes hard and woody so that it will decompose. After the application of the organic material to the soil, several weeks should be allowed for decomposition before the field is seeded for a crop.

The most common green manure crops are madre-*Gliricidia sepium*, philipesera-*Phaseolus trilobus*, sea-weed-*Turbinaria conoides*, sesban-*Sesbania speciosa*, sunn-hemp-*Crotalaria juncea* and wild indgo-*Tephrosia purpurea*.

BAMBOO

Bamboos are tall grasses belonging to the family *Gramineae*. There are about 30 genera and 550 species, growing in the humid tropical and extra-tropical region. 136 species occur in India. Bamboos thrive best in monsoon forests where they develop best. In temperate regions, they dwindle into under-shrubs and at high altitudes some species look almost like grasses. Bamboos are found throughout India. Bamboos differ widely in stature and form. *Dendrocalamus giganteus* is usually 120 feet high, while the *Arundinarias* are mere

shrubs. Most of them grow erect, but a few such as *Teinostachyum helferi*, *Cephalostachyum capitatum* are stragglers, whereas *Melocalamus compactiflorus* and *Schizostachyum* are climbers. *Melocanna bambusoides Bambusa nutans* have a creeping habit. A few forms such as *Microbambus macrostachys* and *Atractocarpa olyriformis* are herbaceous. Bamboos are characterised by woody, pointed stems, commonly called culms arising from their rhizomes which are also woody. Some bamboos flower once during their life time and die out soon after flowering. Flowering takes place at intervals of 25-50 years. But some species flower every third year and a few flower annually. Bamboo seeds germinate readily. During the first few years, the plants look like grasses and are easily transplanted. Bamboos are best propagated by off-set cutting and by layering.

Bamboo is widely used in place of timber, and frequently houses are made completely out of the products of the plant. Bamboo is used in constructional works for scaffolding and for making ladders, bridges, aquaducts, fences, supports etc. Many articles of everyday use are made out of bamboo viz. yokes, axles, tool-handles, cordage, beds, sticks, lathes, tent-poles, brushes, pipes, fans, umbrellas, toys, kites, musical instruments, spears, lance shafts, bows and arrows. Bamboo is the chief raw material for making baskets and wicker-work, which is a cottage industry. Bamboo grains are extensively eaten by the poor classes during famines, and there is a superstition which associates the gregarious flowering of bamboos with famines. Bamboo seeds generally resemble those of rice, but are somewhat bigger in size. The tender shoots are soaked in water, boiled and used in curries and for making pickles.

The successful utilisation of bamboo for papermaking in India is mostly due to the investigations of Raitt. Bamboo pulp began to be manufactured in 1923, and today bamboo forms the most important raw material for the Indian paper industry. For obtaining maximum yield of cellulose, only mature culms, 2-3 years old, are used for pulp manufacture. Bamboos are also used for the production of rayon pulp. The wood suitable for rayon manufacture is made by the sulphite process.

RAYON

The production of a fibre such as rayon, the first of the man-made fibres, had been predicted as long ago as 1664 by Robert Hooke. In 1710 Rene A. de Reaumur, the French scientist suggested the possibility of making silk filaments out of gums and resins, for example, threads of varnish. In 1840 Louis Schwab invented an apparatus that drew synthetic filaments through a small hole. In 1886, Georges Audemars, a Swiss chemist, discovered how to make cellulose nitrate This was the first step towards the nitro-cellulose process of making rayon. In 1884, Count Hilarie de Chardonnet produced the first synthetic textile fibre from nitro-cellulose. He became known as the "Father of Rayon".

Raw materials used for the production of rayon are cotton, bamboo and wood pulp, The liquid substance of cellulose is forced through a metal cap or nozzle about the size of a thimble. This nozzle is called a spinneret because it performs the same function as the silkworm's spinneret. The cap is usually made of platinum because this metal is not affected by acids or alkalies; it is perforated with small holes that are almost invisible to the naked eyes. Through each of the tiny holes, a filament is extruded which is solidified by a liquid bath as it comes from the spinneret. The number of holes in the spinneret may be varied, thus producing at one time any number of filaments of the same size.

Rayon is almost as strong as silk. Yet all rayons are durable, economical and serviceable fabrics in which smoothnes of surface withstands the friction of wear. It is more resistant to perspiration and it is unaffected by salt air.

MISCELLANEOUS ARTICLES

Calamus rotang, Linn.

PALMACEAE

Eng. Cane. Tam. Perambu.

In India it is found in all drier tracts, from sea-level to

1500 feet high. The species of *calamus* is remarkable for the weak and trailing stems of the plants which often extend to a great length and ascend the loftiest trees. These are the stems which, when divested of sheathing leaves, form the cane of commerce. Some of these are much admired as sticks; others, for their flexibility, combined with tenacity. When their smooth, shining and dense outside surfaces are separated in strips, these are universally employed for caning the bottoms of chairs, coaches, baskets and for other domestic articles.

There are also on display some domestic articles like betel nut boxes, small mats and pouches made of palm leaf.

TODDY TAPPING ARTICLES

The articles exhibited in this case are from Tirunelveli district . Only some of the exhibits are used for tapping. The cup-like articles made out of the spathe of areca nut palm are cups used for drinking toddy. There is a vessel like article made out of the areca nut palm spathe. Toddy tappers carrry their knives, wooden mallets. etc,, in such vessels. There is a small wooden mallet used for tapping the palm. There are besides mallets made of bone and iron. The other articles exhibited are leather belts for holding the knives and palmyra ropes for legs and hips used in climbing up the trees.